CRIME SCENE SEARCH AND PHYSICAL EVIDENCE HANDBOOK

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CHAPTER I

INTRODUCTION

The Purpose of a Crime Laboratory

A crime laboratory is a scientific organization with the closely dedicated mission of aiding the process of criminal justice. It provides this aid by answering, or helping to answer, the vital questions of whether a crime has been committed; how and when it was committed; who committed it and, just as important, who could not have committed it. The crime laboratory seeks answers such as these through the scientific analyses of physical clue material collected primarily from the scenes of crimes or from suspects.

Not all crime laboratories have the same capabilites. Some can do much more than others. Laboratories also tend to emphasize and build up expertise in particular areas. The manner of collection of some types of physical evidence, powder residues from the hands of suspects, for example, will vary according to the type of test procedures the laboratory applies. Therefore, it is important that police investigators familiarize themselves with the capabilities of the crime laboratories supporting their jurisdictions, as well as with the requirements of the national forensic science laboratories. The necessary familiarity can be attained without extensive study or great expenditures of time.

Regardless of variances in capability, the basic missions of reducing or eliminating uncertainty in the criminal investigation and supplanting fact for supposition is common to all crime laboratories in the United States. (A national directory of these laboratories is included as Appendix B.)

Physical clue material in and about the scene of a crime is highly fragile in the sense that the elements, time, inadvertent movement, improper handling and packaging and numerous other influences can reduce or destroy its evidentiary value. The legal and scientific standards concerning the collection and processing of physical evidence are rigid. Thus, mistakes can easily be made in processing the scene of a crime; but the more important fact is that mistakes can be easily avoided if sound procedures are followed.

Recent studies of the use of crime laboratory support have repeatedly shown the importance of police training in crime scene search to both the volume of use of a crime laboratory, and the involvement of the laboratory in the more serious crime cases. The proper means of processing a crime scene, marking and packaging physical evidence and transporting it to a crime laboratory require specialized training, however, of a nature that is within every police officer's ability to acquire. Scientific knowlege is not a prerequisite. What is required, in addition to procedural knowlege, is an appreciation of what could potentially be evidence, and what types of information the crime laboratory examiner might obtain from different physical clue material.

Therefore, this book concerns itself with specific procedures and techniques in processing the scene of a crime, and with the characteristics and value of physical evidence.

Involvement of the Crime Laboratory in Crime Scene Search

Crime laboratory examiners are usually highly skilled at processing the scene of a crime; and most have standing operating procedure concerning their response to the scenes of homicides and certain other felonies. However, the time they can devote to performing crime scene searches is severely limited. Thus, the decision of the police investigator to request a crime laboratory's assistance in this regard should relate to the relative degree of expertise and special equipment that would be required, as well as to the seriousness of the offense itself.

Criminalistics Defined

The term criminalistics is used frequently in this book; and criminalistics laboratory is applied synonomously with crime laboratory. It is therefore important to the common understanding of the readers that the meaning of the term criminalistics as used here be defined.

Criminalistics may be defined as a profession and scientific discipline which is directed toward the recognition, identification, individualization, and evaluation of physical evidence by application of the natural sciences in law-science matters.

CHAPTER II

BASIC CONCEPTS CONCERNING PHYSICAL EVIDENCE

INTRODUCTION

The value of physical evidence is determined by how useful it is in verifying that a crime has been committed, identifying the person or persons who did it, and exonerating all other persons who may be under suspicion.

Physical evidence has great potential in all these regards. But to realize its full potential, the police, the crime laboratory examiner, and the prosecutors must join to produce a set of facts that make it unreasonable to believe any conclusion other than the one the facts support--even though any one of the facts may be open to reasonable doubt.

In order to accomplish this important task, there are certain qualities of evidence that must be attained, and some minimum quantities collected before the crime laboratory can be of any assistance. It is no exaggeration to say that, in the majority of cases, the police officers who protect and search a crime scene play a critical role in determining whether the scientific expertise of the laboratory will be brought to bear in a case.

MAJOR CONSIDERATIONS IN THE ESTABLISHMENT OF IDENTITY

Identity is always sought in criminal investigations. Was the revolver found on a suspect the one that fired the bullet found in the body of a murder victim? If so, was it the suspect who fired it? More often than not the answers to such questions must be sought from seemingly unrelated items of information and physical evidence. Therefore, several important concepts bearing on the quality and usefulness of physical evidence in establishing identity should be considered. Basically, these concepts are:

- Mathematical probability
- Class characteristics and similarity
- Comparisons
- Individuality
- Rarity
- Exchange
- The relationship of experience to the investigation

Mathematical Probability

This concept underlies virtually every human action. Personal judgments on the result of an election, and on whether to buy a particular stock are based on the idea that the outcome of an event can be logically estimated. The estimate is, of course, related to known conditions, past performance, and experience in the outcome of similar events, among other things. A familiar, and probably overworked, example of mathematical probability is the results of continual tosses of a coin. Aside from the almost-unheard-of event of the coin landing and remaining on its edge, there are only two possible outcomes: the coin may land tails or it may land heads. There is no known scientific reason why the coin should fall on one side more often than on the other. Therefore, we can state that the probability of the coin landing heads in any single toss is 50-50, or more simply expressed, 1:1. The importance of mathematical probability to the quality of physical evidence is more readily apparent when one considers the use of fingerprints to establish a positive identification of a suspect. When considering the type of pattern, the ridge count of loops, the tracings of whorls, and the relationship of the ridge details of the pattern, the likelihood of two prints being the same (or at least with no detectable dissimilarities) is estimated to be as high as $1:10^{60}$ (a number which, expressed in conventional form, would be a 10 followed by 60 zeros). If we accept this estimate, we conclude that, in the whole population of the world, the probability is that no two individuals have the same fingerprint. Thus, mathematical probability provides a very firm base of confidence in fingerprints as a means of establishing identification.

In the same vein, some of the body's fluids can be considered in relation to both their type and the mathematical probability of the occurrence of that particular type. Blood is the outstanding example in that connection. There are four major types of human blood: O, A, B, and AB. Any bloodstain of human origin will be identified as one and only one of these four types. From experience and study, it has been established that blood grouping is a matter of heredity and that the following frequency of distribution of blood types will be noted in any large segment of a population:

Blood Type	Percentage of Occurrence in the Population	Probability of Occurrence of the Type
O	40	8:20
A	40	8:20
B	15	3:20
AB	5	1:20

The significance of the above information is in the probability of occurrence of the different blood types. For example, type O blood is eight times more common than type AB. Thus, if a type O blood sample is found, far fewer people would be eliminated than if an AB sample were found. A type AB sample is therefore a higher quality evidence than a sample of type O blood.

The greater the frequency of occurrence of a given type of blood the less significance can be attached to the evidentiary value of that type of blood sample. In connection with statistical probability, we must also consider the concept of mutually exclusive events; which are those events that, by the nature of their occurrence, always preclude some other events. For example, we have already noted that it is not possible for an individual to have blood of two different types. Therefore, should a blood sample taken from the scene of a crime prove to be type A, it may be concluded with certainty that the blood found at the scene of the crime was not that of any suspect with a blood type other than A.

There are forms of physical evidence that do not lend themselves to statistical evaluation because we lack data that would support an estimate of the frequency in which a particular type of physical evidence might be encountered. For example, we do not know what the statistical probability would be of observing a particular configuration of a tool mark. The value of this type of evidence must therefore be estimated on the basis of experience alone. Even though statistical data are lacking, it is possible to relate the particular observation of an event or item to experience; and thus to form an opinion as to the value of the evidence. In the case of a friction impression on metal, for example, experience has shown that the microscopic relationships between that impression and the tool that made it are so specific that they may be considered unique. The basis of any opinion concerning a piece of physical evidence must be experience that equips the observer to note the unique points of contrast or similarities that distinguish the item (or event) from a larger body of items or occurrences. For example, many typists have used the same typewriter for years and do not know whether the W has a full wedge or a half wedge in the center. Thus, their experience with typewriters is of little value because they had no particular reason to pay attention to such details.

Statistics reflecting crime experience often provide valuable investigative leads (by which we mean any experience, data, or reasonable assumptions concerning how or by whom a crime was committed that help narrow the investigative field). There is not a high enough probability that an investigative lead will prove correct to equate it with evidence. But a good lead offers too much promise in the narrowing process to be ignored. An example serves to illustrate the point. Statistically, it can be shown that most burglars are men. Certainly, many such crimes require exceptional physical strength and mechanical skills. Thus, while these statistical probabilities do not rule out a particular burglary being committed by a woman, they provide a strong lead as to the sex of the offender.

The study of criminal modus operandi (or method of procedure) is based on statistical correlations, and on the known probabilities that crimes exhibiting a certain and consistent "style" will be committed by the same individual or group. At the same time, the investigative leads derived from those probabilities and the observation of type crimes do not preclude the possibility that the crimes, no matter how similar in method, are being committed by different individuals. Thus, the lead serves neither to prove nor disprove a fact, it only points the way to ascertaining that truth through other means.

Class Characteristics and Similarity

Here again we are dealing with a concept that every individual is familiar with--that of grouping things according to similar characteristics and then further grouping them by increasingly restricted definitions. Figure 1 illustrates the application of this principle to the examination of a heel impression.

Basically, any major or subclass of physical evidence items can be what the investigator wants them to be. A shoe heel can thus be classified as a adult size man's oxford, right/left, particular brand name or device, and so forth.

Class characteristics of an item therefore allow it to be screened before a more detailed comparison is made between it and another object to determine individual characteristics that may later lead to the establishment of specific identity (see Figure 1).

Individuality

Individuality is what makes one thing different from all others similar to it. A man has thousands of characteristics that are common in other men. However, every human being has many physical characteristics, such as fingerprints, that make him or her unique. If there are enough common characteristics identifiable, or if there are known unique characteristics, practical identity of a person may be established. The same may be said of the identification of objects.

The process of identification of any object or person is thus basically one of establishing the fact that it belongs in a large group or class. But determining the identity of an object or person depends on establishing that it is the only one of its kind in that group. Thus, a man belongs to the general class of human beings. However, he has unique identity in that class.

With some forms of physical evidence, it is not possible to establish identity. Blood, hair and semen are examples. Although these physiological fluids can, in most cases, be typed, such typing only places the sample in one of several broad categories, and does not provide identity of a person.

EXAMPLE OF CLASS CHARACTERISTICS AND
INDIVIDUALITY OF AN EVIDENCE ITEM

Photo: KCPD

The above heel print, collected by the Kansas City Police Department at a crime scene, can be put in the general class of heelprints, and further subclassified as men's, right shoe, brand: O'Sullivan. The heel that made this print can therefore be identified as belonging to the general class and subclasses just mentioned. However, the unique characteristics of this shoe heel are the damage marks and wear patterns that can be seen, such as those marked by arrows. This, combined with the class characteristics, may serve to establish identity of the shoe heel that matches them.

FIGURE 1

Firearms and tools, on the other hand, usually have a high degree of individuality because of some marks or imperfections left on them in their manufacture. Similarly, a tool or the riflings of a pistol barrel can impart to the objects that come in contact with them some highly individualistic markings that can establish the identity of the tool or weapon used. Wear on an object frequently imparts to it individuality that is sufficiently distinctive to allow identity to be established.

Individuality of a thing will not necessarily support an identification. For example, a certain type of paint has individuality by virtue of the way it was manufactured and the materials used. However, a chip of that paint cannot be identified as having originated from the fender of a particular automobile simply by establishing that it has the same manufacturing origin as the paint on the car. A fracture match between the paint chip and the edge of the area on the fender would, on the other hand, establish the specific origin or identity of the chip.

Comparisons

The most definite point of comparison between objects is an obvious physical match: for example, between the bit of a screwdriver and the shank from which it was broken, or a splinter of wood and the part from which it split.

The lesson to be seen in these comparisons is that any item that suggests a rip, tear, or breakage should spark a thorough search for its counterpart or for the object that was used to inflict the damage.

Rarity

Exceptional circumstances connected with the place, time, or general conditions under which physical evidence is discovered tend to heighten its quality. For example, a hairpin found near the body of a single woman murdered in her own apartment is of far less evidentiary value than would be a man's tie clasp found in the same location. In this hypothetical setting, it would not be unusual to discover a hairpin. A man's tie clasp, on the other hand, would fit the criteria of rarity because of its unusual location.

The investigator should sharpen his perception of the rarity of time, place, and circumstance associated with physical evidence found in or near the crime scene. Specifically, he should give careful consideration both to the setting in which items are found and their physical condition. The determination as to whether something should be collected as evidence will frequently rest on whether it seems out of place, whether it seems unusual for the item to be in a certain place, and whether its condition indicates unusual change.

Exchange

When two objects come into contact, there will frequently be a transfer of small amounts of the material from one to the other. This is nearly always the case when fabrics come in contact with a rough surface. Therefore when a suspect comes in contact with the victim and objects at the crime scene, he frequently leaves behind traces of himself and takes with him traces of the things he has touched. Materials transferred in this way are normally referred to as trace evidence. The term trace evidence is usually very loosely defined; however, it most often is applied to minute or microscopic bits of materials that are not immediately apparent to even a trained investigator. Thus, trace evidence is usually in the hard-to-find category. Because trace materials resulting from exchange are less likely to excite the attention of the criminal, or even to be apparent to him, there is far less probability that they will be deliberately eliminated by him than is the case with larger items of evidence or latent prints.

The following hypothetical situation illustrates the potential for the exchange of physical evidence during a series of fairly typical criminal actions.

The criminal crosses the back porch of a residence and steps on a brown paper bag lying on the floor. To gain entry, he breaks a small glass pane in the back door and reaches in to unlock the door. After gaining entry, he is surprised by the homeowner and a struggle follows. During the struggle the victim's nose begins to bleed. The suspect flees the scene.

In a situation of this type, the following exchanges of materials are entirely possible:

- The suspect's shoe print to the brown paper bag on the back porch.
- Fibers from the suspect's clothing to the edge of the broken pane of glass in the back door (or blood on the glass from a cut on the suspect's arm).
- Fingerprints to the glass on the back door, and possibly to other surfaces along the suspect's route of entry.
- Fibers from the suspect's clothing to the victim's clothing during the struggle, and vice versa.

The following (transferred) evidence may be found on or in possession of the suspect:

- Glass fragments or small paint chips on the outer garments of the suspect from the back door window pane and frame.
- Blood or hair from the victim to the suspect's clothing.
- Bruises or lacerations suffered by the suspect in the struggle with the victim.
- Fibers from the rug or furniture at the crime scene on the shoes or garments of the suspect.

It is apparent from this example that the possibilities for exchanges of trace materials are great. Even if the shoe prints and fingerprints are excluded from the array of physical evidence potential, there are still abundant opportunities to link the suspect with the crime scene, if proper collections are made at the scene and from the person of the suspect.

CHAPTER III

PROTECTION OF THE CRIME SCENE

INTRODUCTION

This chapter deals with procedures to protect the crime scene and initial measures to be taken to preserve physical evidence.

The scene of any crime is itself evidence, and the testimony of a trained police officer concerning observations and findings at an unchanged crime scene is vitally important to the successful clearance of the case. Improper protection of the crime scene will usually result in the contamination, loss, or unnecessary movement of physical evidence items, any one of which is likely to render the evidence useless. Therefore, the first officer to arrive at the scene of the crime automatically incurs the serious and critical responsibility of securing the crime scene from unauthorized intrusions. Even though the officer who arrives first will also search it for physical evidence, the necessity to immediately take precautions to protect it remains unchanged.

DIMENSIONS OF A CRIME SCENE

Obviously, there is no definite rule or set of rules that can be applied to defining the dimensions of the scene of a crime. However, the best physical evidence is normally found at or near the site of the most critical action that was taken by the criminal against property or the victim. Thus, it is more likely to find important physical evidence in the immediate area surrounding the body in a homicide case than at some distance away. Similarly, the site of forcible entry into a building, or the area immediately surrounding a cracked safe, normally have the greatest potential for yielding evidence. While it is entirely possible that the dimensions of a crime scene will be large, there will usually be apparent to the investigator priority areas that should be given immediate protection. On the other hand, valuable evidence may be discarded or inadvertently deposited by the criminal at some distance from the (apparent) immediate scene of the crime. Thus, the area to be protected may eventually be considerably expanded beyond the limits of that considered to have the highest priority.

INITIAL ACTIONS ON ARRIVAL AT THE SCENE OF A CRIME

The success of an investigation that involves a definable crime scene depends heavily on the initial observations and actions of the first officer to arrive at the scene. This statement is generally applicable, regardless of the type of crime. While the circumstances of the particular case will naturally govern the actions taken by the officer to protect and preserve the physical evidence, the following are considered to be generally valid guides:

- If injured persons are discovered at the scene of the crime, giving them aid is a matter of first priority.

- If sufficient police personnel are available, the immediate measures necessary to protect the crime scene should proceed simultaneously with giving aid to injured persons, or examining apparently deceased persons.

- The immediate protection measures include roping off certain critical exits or apertures, posting guards to control spectators around areas expected to have high potential for physical evidence yield, and covering areas that would be affected by smoke, rain, snow, or direct sunrays.

- In extreme cases, it may be necessary to move objects that seem to have evidence potential from areas where they would otherwise be destroyed or drastically affected by the elements. <u>However, movement of evidence prior to the time it has been fully examined and processed should be avoided whenever possible</u>.

- Because this handbook is concerned with the collection and preservation of physical evidence, certain critical operational matters connected with the processing of the crime scene are not discussed in detail. However, it is well to note that arresting suspects, detaining witnesses, and requesting assistance, if needed, would all be integral to the actions that would be taken by the first officer or officers on the scene of a crime.

- The underlying intent of all actions taken to protect the scene of a crime is to preserve its physical aspects so that it may be reviewed in detail by the detective or laboratory examiners assigned to the case. Thus, the major task of the officers preserving the scene is to prevent certain actions, specifically:

    - Unnecessary walking about. Particular precautions must be taken to avoid walking in areas that are likely to bear the impression of foot or tire prints.

- Moving items or disturbing the bodies of deceased persons.
- Touching items or surfaces that are likely to yield latent fingerprints.
- Allowing any item to be removed from the scene without the specific permission of the officer or laboratory examiner who is in charge of the search.

- It is important that restraints not be lifted until the investigator in charge has specifically released the crime scene, or at least until the search has been completed.

- As soon as time permits, the following details should be noted: time of arrival on scene, weather conditions, persons present at the time of arrival on scene, and other important circumstances that will aid the investigation.

- The officer first assuming responsibility for the crime scene must cooperate with the detectives, laboratory examiners, and other specialists who may later search and process it. The officers who secured the scene should make all their information immediately available to any officers who subsequently arrive to take charge of the investigation or to conduct a search. Details are important. For example, if an item were touched or moved by police personnel who secured the scene, that fact should be made known to the investigating officers or laboratory examiners. It is possible that the crime scene will undergo some physical change as the result of weather or some other action after the arrival of the officers who secured it and before the arrival of other investigators or the crime laboratory specialists. If so, the officers who arrived first should pass on their observations of such changes.

CHAPTER IV

AN OVERVIEW OF TECHNIQUES FOR PROCESSING THE CRIME SCENE

INTRODUCTION

A competent search of a crime scene demands specialized training, an understanding of basic procedures, an appreciation of the "why" of certain actions, and close attention to detail in carrying them out. This chapter deals with certain basic considerations, guidelines, and procedures that help the investigator to avoid oversight, to insure thoroughness of the search, and to comply with both the legal and scientific requirements that always bear on the use of physical evidence. However, it is well to note again that none of the guides, rules, or procedures presented here are intended to supplant the officer's judgment.

At times, the opportunity to uncover physical evidence in a case may appear remote, or the search of a crime scene may be a personally objectionable experience. Certainly, no rational man enjoys examining the scene of another's death or misfortune. But it is precisely because items or materials that may, at first, seem unimportant prove later to be a critical aspect ot the investigation that the investigator should approach the search of the crime scene with determination and a particular alertness.

LEGAL AND SCIENTIFIC REQUIREMENTS

To satisfy the legal requirements concerning physical evidence the investigator must be able to:

- Identify each piece of evidence, even months after he collected it.
- Describe the exact location of the item at the time it was collected.
- Prove that from the moment of its collection until it was presented in court, the evidence was continuously in proper custody.
- Describe changes that may have occurred in the evidence between the time of its collection and its introduction as evidence in court.

Scientific requirements in the handling and processing of physical evidence are basically that the evidence be protected from change or modification. Biological materials will always undergo some change, and the weather or other unavoidable circumstances may induce change in other types of materials. Therefore, the practical objective of the investigator in satisfying scientific requirements is to take every precaution to minimize change. Examples of the type of changes that must be avoided are the use of unclean containers that would introduce chemical or bacterial contamination to a sample; the use of containers that allow spillage, evaporation, or seepage of a sample; or alteration of an item by accidentally scratching, bending, or even touching it, or cross-exchange, such as placing the suspect tool to be examined for paint in intimate contact with the painted wood frame from the scene.

THE PRELIMINARY EXAMINATION OF THE SCENE

Aside from any other consideration, the investigator should consider the crime scene as highly dynamic, that is, undergoing change; and fragile, in the sense that the evidence value of items it contains can be easily downgraded. Usually, there is only one opportunity to search the scene properly. Making a good preliminary survey of the layout helps to use that opportunity to best advantage.

The investigator should first take into account all the information and opinions that have been accumulated by persons preceding him on the scene. The apparent physical focal point or points of the crime are of particular interest in this information exchange, as are the perceptions of other officers as to items or material having potential evidentiary value.

Preferably without entering the more critical areas of the scene, the investigator should, in this preliminary examination, assimilate the items, conditions, and locations that seem to have the greatest importance to him. The key words at this stage of the search are observation and recording, rather than action. The relative position of items, one to the other and to the victim, if any, can be as important to the investigator as an item itself. Notes concerning these matters should be taken. It is useful to photograph the scene at this time, providing that doing so does not require traversing areas before the preliminary survey is completed.

Statements of witnesses should be considered, as well as background information that can be gathered concerning any victims involved. The descriptions of witnesses of things they observed should be amplified, whenever possible, by photographs taken by the investigator. Such photographs should take the perspective the witnesses had and notations should be made as to the lighting conditions and measurements which may tend to support or disprove the witnesses' statements.

If the search will be a lengthy one, the investigator should choose an area close by, but not in a critical area, which he designates as a collection point for trash generated in the search, and the place where police and other official personnel may smoke. Equipment not in immediate use should be placed in this area. Such a "headquarters" can significantly reduce the chance that the scene will be contaminated.

When the initial survey of the scene is completed, the investigator should have noted the obvious items of evidence to be collected; decided in what order he will collect them; concluded what should be searched for; and decided how the tasks and area are to be divided, if more than one investigator is employed or if the scene is unusually large. Figure 2 illustrates part of this process.

The Importance of the Investigator's Experience and Insight

A crime scene search is greatly aided by procedures such as those just outlined. However, the success of any investigation is always the function of the intellect and experience of the officer. He must develop an hypothesis that will serve as the initial framework for the investigation. That hypothesis, based on the first survey of the scene, is simply a set of reasoned assumptions concerning how the crime was committed and the general sequence of acts that were involved.

The hypothesis must be constantly reassessed in light of each new fact or lead that is uncovered. There is a common tendency to make contradictory information fit a set of assumptions already made. For example, if the investigator has substantial evidence that a murder was committed where the body was discovered, he may be tempted to ignore a fact or lead that does not fit the framework of that idea. Such inflexibility must always be avoided in the crime scene search. The investigator must be willing to modify, or change altogether, his initial ideas concerning the commission of the crime. It is only through such a process of reassessment that the full value of the investigator's experience can be realized.

Recording the Crime Scene

The specific techniques and requirements for recording the scene are covered in detail in Chapter V. It is therefore sufficient to note here the importance to the successful outcome of the case of the written, photographic and perhaps the audio record of the scene compiled by the investigator. The point was made earlier that one of the principal legal requirements in introducing physical evidence in court is the ability of the person who collected it to later identify it and accurately report the circumstances of its collection and custody. An adequate record of the crime scene aids considerably in this identification process. But just as important is the support the written and photographic record of the scene gives to the furtherance of the investigation and examination of the physical evidence by laboratory experts. Finally, the investigator's notes provide him with an immediate reference as to the actions taken during the search and with a ready means of doublechecking on the thoroughness of those actions before leaving the scene of the crime. The amount of detail involved in a major case is usually so large that very few investigators can successfully rely on their memories.

INITIAL SURVEY OF THE INDOOR CRIME SCENE

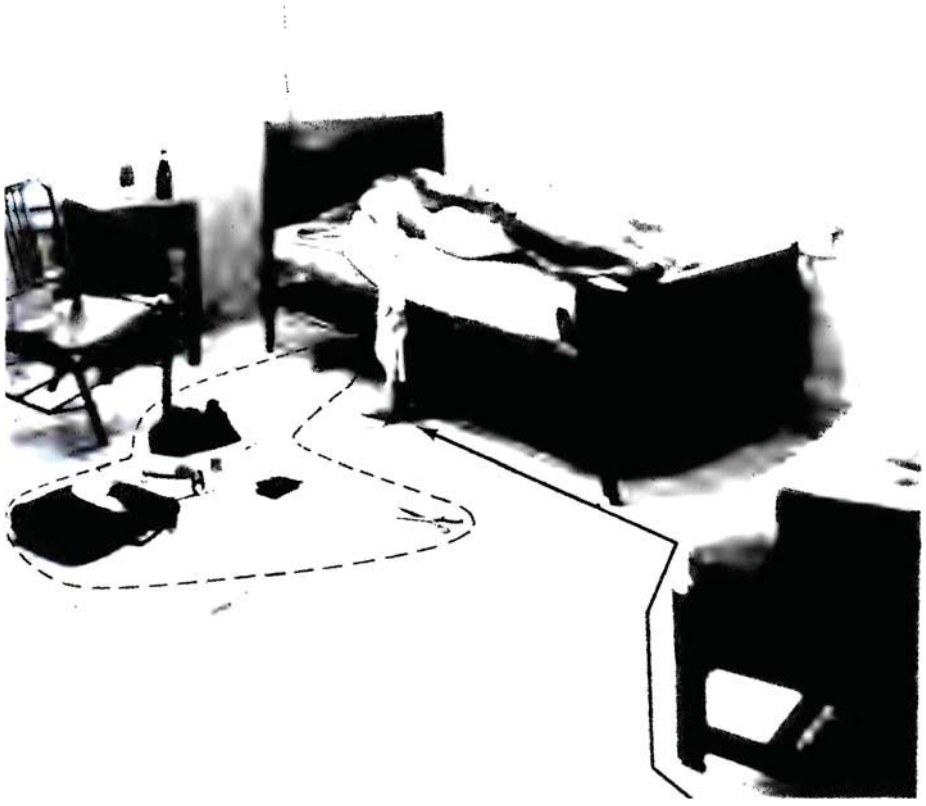


Photo: MRI

In this mock scene, representing a murder, the body is, of course, the focal point. The investigator makes a quick survey from the doorway and moves to the bed by a route (arrow) that avoids the items lying on the floor (circled area). After examining the body and having it removed, the first area to be processed is the one circled by the dotted line. It not only contains items with obvious evidence potential, but is also critical to free movement about the scene.

FIGURE 2

Barring unusual circumstances, the crime scene is recorded before any objects are collected or removed from it. This statement does not, of course, apply to injured persons, and does not necessarily apply to the bodies of deceased persons, as will be discussed later.

THE DETAILED SEARCH OF THE SCENE

The literature on crime scene search includes several classifications of methods: the point-to-point, the area or sector method, and the concentric or spiral search technique. Although all such techniques have validity, given the right set of circumstances, it is difficult, and perhaps academic, to define just how they differ from one another and how a single method would apply to a given situation. For this reason, the following discussion of search techniques does not concern itself with such classifications.

The method used must always support what the search is intended to accomplish: a comprehensive and nondestructive accumulation, within a reasonable period of time, of all available physical evidence. The search should also economize on movement and avoid unnecessary disturbance, as already noted.

In order to insure a systematic approach to the search of a large scene, particularly one outdoors, it may be useful to segment the area. However, this type procedure is required only in exceptional circumstances.

A Recommended General Method of Crime Scene Search

Although the circumstances of the case must always govern the investigator's actions in processing the crime scene, experience has shown that the following general rules are useful in helping to systematize the search and to prevent error.

- If there is evidence that is being significantly deteriorated by time or the elements, these have first priority. Otherwise--
- All of the major evidence items are examined, photographed, recorded and collected, as appropriate, taking them in the order that is most logical, considering the requirement to conserve movement. Making casts and lifting latent prints from objects to be moved from the scene is done as necessary. Items should not be moved until they have been examined for trace evidence. Fingerprints should be taken, or at least developed and covered with tape, before the object is moved.

- When an (obviously) deceased person is involved, the evidence items lying between the point of entry to the scene and the body are processed; then the detailed search of the deceased is conducted. After that search, the body should be removed, and the processing of obvious evidence continued as noted above (see Figure 2).

- After processing the more obvious evidence, the search for and collection of additional trace material is commenced. Trace evidence should be searched for and collected before any dusting for fingerprints is done.

- After the trace materials have been collected, other latent prints are lifted.

- When sweeping or vacuuming, surface areas should be segmented, the sweepings from each area packaged separately, and the location of their point of recovery noted.

- Normally, elimination fingerprints and physical evidence standards are collected after the above actions have been completed.

Trace Material Collection

Objects which will not be transported to the laboratory should be handled very carefully, and as little as possible, to avoid loss of trace materials. In particular, careful examinations should be made for blood, hair, fibers, and other fragile materials which could easily be lost or destroyed in the process of dusting for fingerprints. Any trace items discovered should be immediately removed, properly packaged, sealed, and marked.

Items that will be transported to the laboratory should also be carefully examined before moving them. (By this stage in the search, such items should have been recorded in the notes and in the sketch, and photographs taken of them during the preliminary examination. However, if an item is a new discovery, it should be recorded before it is moved.) Any friction on a surface will destroy fingerprint traces; therefore, nonporous materials, such as glass, metal, and finished wood, should be processed for fingerprints, or at least the prints should be developed and covered with tape before transporting the item to the laboratory.

Some trace materials will be discovered during the search. Others may not be noted except by the crime laboratory examiners; for example, in their analysis of sweepings taken from the crime scene. The general rule of evidence collection of moving from the obvious to the hard to discern items, applies also to the collection of trace evidence. After collecting the discernible trace materials, critical areas of the crime scene are then vacuumed (with care taken not to destroy latent prints). The sweepings from different areas should be kept separate. For example, if the area around the point of entry is swept, the sweepings of this area should be packaged separately from sweepings from the area around the body, then sealed and marked accordingly.

Tool Marks

Tool marks are particularly valuable evidence because they can frequently be proved to have a unique relationship with the item that made them. Impressions made by objects in metal are of the highest quality evidence because of the tendency of the hard surfaces to retain even microscopic marks. For this reason, it is usually very desirable to remove the item or material containing the mark in order that it may be examined in detail at the criminalistics laboratory. If it is too bulky, cast it with silastic.

Samples of Body Fluids

Chapter VII and parts of Appendix A deal specifically with the subject of collecting and packaging body fluid samples. It is, therefore, sufficient here to note only the more critical procedures as they apply to the crime scene search.

Blood is the most commonly discovered body fluid on the scene of a crime. Fresh, or at least liquid, blood must be collected with a clean medicine dropper, placed in a glass vial, and saline added. If the blood is soaked into a porous material, the sample should be allowed to dry away from heat or sunlight. Dried blood on objects is best left alone, and the object itself sent to the laboratory. Frequently this is not possible. Therefore, the alternative procedure is to scrape the dried blood from the surface with a clean knife, razor blade, or scalpel into a pill box or a clean paper receptacle. In such cases separate scrapings should be taken from the surface immediately surrounding the stain. These scrapings, placed in a separate container, are forwarded to the laboratory with the blood sample to determine whether the material from which the blood was taken affects the laboratory tests of the sample. If bloodstains are cut from a piece of cloth, such as the seat of an overstuffed chair, enough of the unstained material surrounding the stain should be included in the sample to perform control tests.

Items that apparently bear seminal, urinary, or other stains are also sent, intact, to the laboratory for examination whenever that is possible. If not, the above procedures for sending only a sample of the material apply.

Standards of Items To Be Secured

Standards provide a base of comparison of the same material that may be later collected as evidence. Standards also refer to material, such as the scrapings from the area around a bloodstain, that may influence the results of tests of that blood.

Items that were apparently damaged or broken during the commission of the crime are particularly valuable as standards. Common standard materials are paint chips, glass slivers, bits of metal, and fibers. If any similar materials are later found on the person of a suspect, such standards are essential to help link the suspect with the scene of the

crime or a particular act. Material which may have transferred to the suspect should also be collected. Samples should be collected of the soil in an area likely to have been in the suspect's path of entry and exit, as well as fibers from carpets, if applicable.

Elimination finger and palm prints should be secured from all persons who had legal access to the crime scene. If foot and tire tracks are collected during the search, these impressions should also be collected from vehicles and persons who had legal access to the scene.

Standards should always be collected before the crime scene is released. Owners will usually clean the scene of any materials resulting from struggle or damage, and have broken items repaired or disposed of. Therefore, the investigator should not depend on being able to return for standard material. The decision concerning which material is valuable as a standard is largely the function of the investigator's experience and judgment. However, it is always better to err in the direction of collecting too many, rather than too few, such samples.

Fires and Explosions--Special Considerations of Search

The fire or explosion scene is processed in basically the same way as other indoor crime scenes, so far as the protection and preliminary stages are concerned. However, the detailed search involves some special considerations and problems. The fire or explosion may have been set to cover up another crime such as homicide, burglary, or theft, or it may have been set to destroy records or physical property so that the owner could collect from the insurance company. In contrast to these possibilities, however, the fact is about 80 percent of all fires and explosions are proved to be accidental, even though they occur under ostensibly suspicious circumstances. The basic problem facing the investigator in a fire and explosion is to determine if a crime has been committed.

In searching a fire scene, the investigator should be particularly concerned with discovering the point of origin. If there are several origins that have no logical explanation, he may be reasonably certain that the fire was set. The known or apparent areas of origin should be very carefully searched, and samples collected of any form of fuel that may be discovered. Petroleum products and soil samples from areas where such products are suspected to have been used are of particular interest. When the damage has been heavy, the origin of the fire or explosion usually may be discovered only by carefully removing any debris on top of it.

A search should be made for "trailers" which can be virtually any form of combustible materials that would or did allow the fire to move from one area to another, and devices, such as electrical timers, candles, and clockworks which may have been used to delay the ignition.

Where an explosion has occurred, the investigator must concern himself with the nature of the explosive material. If the explosive was lighter than air, as in the case of natural gas, the walls will be blown or bowed out near the ceiling. If the material was vapor, heavier than air, the walls will be blown out near the floor. If the exploding material was a solid, with low order burning characteristics, there will be a noted pushing effect and a gap in the force path wherever it passed large fixed objects, such as upright posts. High order explosions, of which dynamite is a good example, create a local shattering effect at the center of the blast.

The nature of the exploding material gives some indication of the type container and igniting device to search for. For example, if the fire was set by use of liquid petroleum, the investigator should search specifically for the fuel containers. Such containers may be somewhat unorthodox. For example, a Kansas City arson involved the use of plastic-lined boxes to hold the ignition fuel. Any containers found should be placed in airtight containers before being transferred to the laboratory. Fuel which was not consumed by the fire is frequently washed into the adjoining charred material, a point which is often overlooked in the investigation of a fire where liquid petroleum was used.

Special Considerations in Searching Outdoor Crime Scenes

The method of searching an outdoor crime scene is much the same as that used for the indoor scene; but the nature of the site will influence the types of materials that will be collected.

Because there are far fewer smooth surfaces in the outdoor crime scene, fingerprints will be found less frequently than in the indoor situation. This does not, of course, preclude discovering prints on manmade objects such as weapons, cans, bottles, or other items which may be found in or close to the scene.

The recording of the outdoor crime scene is generally more difficult than that of the indoor scene because there are fewer reference points to work from.

In planning the detailed search of the outdoor crime scene, the investigator should give considerable attention to the route to be taken to the focal point of the crime. Almost all the evidence that will be recovered will be on the ground, and can therefore be easily overlooked or walked on. If possible, the approach should follow a route that seems least likely to have been used by the criminal. The vegetation in the area should be examined closely for damage. In this way, it may be possible to discern the path taken by the suspect and also to help reconstruct the events leading up to the crime. Tree limbs or woody vines able to sustain a tool mark should be carefully noted and collected. Figure 3 illustrates these points.

The area close to the body should be searched for materials which may have been transferred to the suspect during the commission of the crime.

Photo: MRI

The tire tracks represent the most likely route to have been used by the criminal. Thus, some other route, as shown by the arrow, should be used by investigators in their initial approach to the body.

FIGURE 3

In homicide cases, the area directly under the body should be given the greatest attention. It is here that important physical evidence is most likely to be found. Although the wind may blow away items of trace evidence originally on or around the body, evidence that is under the body will usually be trapped and protected from the weather. However, a note of caution at this point. The body should first be examined to the extent possible while in the original position discovered, and only then moved. As soon as the body has been removed, the area under it should be recorded and searched. After this area has been searched carefully and all obvious evidence items recovered, samples of the soil and other remaining materials should be placed in a cardboard box and transported to the laboratory to be examined in detail. Vegetation itself is of little importance, but the microscopic materials that it may carry could be valuable evidence.

A careful search should be made for tire and shoe impressions and any such impressions discovered should be photographed. (A ruler should be included in the photograph to provide a scale reference.) If the investigator can determine the position on the vehicle of the tire that made the impression, he should include that fact in his notes. Soil samples should be collected when foot or tire impressions are found. These samples are taken from the immediate area of the print. This technique is illustrated in Figure 14, p. 82. Each sample is placed in a separate container and its exact location, date, time of collection, and other information recorded in the investigator's notes.

Broken limbs or twigs of trees or bushes around or leading to the focal point of the crime should be examined closely for fibers or fragments of clothing, paint chips, and other trace evidence items that may have been deposited by the passage of the suspect or his vehicle. The examination should also include the area around the base of any tree or bush that appears to have been altered by the passage of an object.

If blood or semen is suspected to be mixed with soil, samples of the soil should be collected.

Vehicle Searches

Detailed searches of vehicles must be as carefully planned and systematically carried out as those for indoor and outdoor crime scenes. The nature of the case will dictate how detailed the search must be. In hit-and-run cases the outside and undercarriage of the auto must be examined with particular care. In cases of homicide or burglary all areas of the vehicle should be given about equal consideration.

Exterior Search

The exterior of the automobile should be searched first. The search should be conducted systematically around the car, always giving the grill area and the hood particular

attention. The investigator should look for broken or damaged areas, cloth imprints in dust or road grime on the automobile's finish, the presence of hair or fibers clinging to any part of the car, parts missing from the car, and so on. Any such items or conditions noted should be recorded, photographed, sketched, and collected as they are discovered, with due care being taken to avoid destroying latent fingerprints.

After this initial search has been made, the exterior of the car should be examined for fingerprints, following the same general procedure just described. The top of the car, the deck lid, the areas around the door handles, and the window glass should be given particularly close attention. As each fingerprint is developed, it is lifted and marked.

Interior Search

Only after the exterior of the vehicle has been searched for fingerprints, and all such prints lifted and recorded, is the interior search commenced. Following the general search procedure, the large evidence items are examined, recorded, collected, and packaged. Photographs are taken as required. The interior of the automobile is generally divided into five major areas for the purpose of the search: right front, left front, right rear, left rear, and the rear deck above the back seat (see Figure 4).

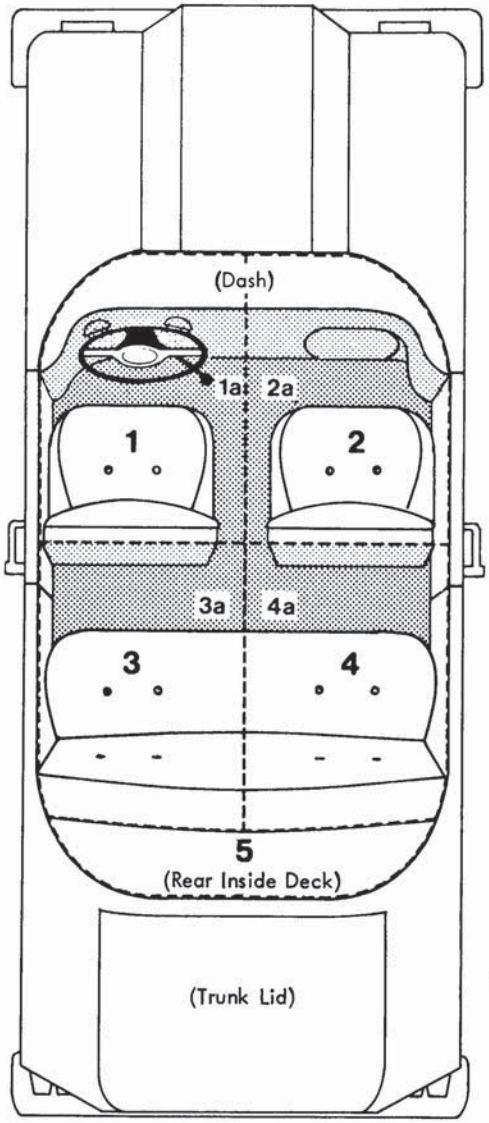
The first four of these areas are further subdivided to distinguish the floor areas from the seats and surface of the instrument panel. The purpose of making such divisions is to include sweepings from all areas that would normally be contacted by passengers riding in the respective positions and to distinguish sweepings taken from the floor from those taken from the instrument panel and seats.

Before entering the automobile, the investigator should vacuum the floor of the four passenger areas and place the material recovered from each area in a separate container. (A special filter attachment must be used on the vacuum.) Each container of sweepings must be clearly marked to show the part of the vehicle from which recovered, together with other usual identifying data.

In the front passenger area, for example, the seat and the top of the dash in front of the seat are swept. Thus, if the investigator is sweeping the right front area, the seat and back cushion, the interior of the right door, and the right half of the instrument panel are included. In the back passenger area, the appropriate back part of the front seat and the interior rear door (or side panel) are included. However, the interior back deck or package ledge is not swept until after the interior search for fingerprints has been made. The four floor areas are then swept when danger of wiping evidence off the seats is minimized by previous sweeping.

The passenger area should always be vacuumed before a search is made for fingerprints. This procedure is used to reduce the possibility that the hair and fibers already present in the vehicle, and those that may be transferred from the investigator's person, would be mixed with the material recovered. Care must be taken in making these sweeps to insure that latent prints are not destroyed.

EXAMPLE OF THE METHOD OF SEGMENTING A VEHICLE INTERIOR FOR SEARCH



Note: Each of the Numbered Areas are Searched Separately, and Sweepings are Separately Packaged

FIGURE 4

After the search for fingerprints in the interior of the vehicle is finished, a search for items of evidence hidden in the interior is conducted, such as drugs, weapons, and loot from the crime. This aspect of the search should also be systematic. If possible, two officers should cover the same areas to reduce the possibility of overlooking items.

Any stain observed in the search of the interior or exterior of the vehicle should be photographed and its exact location recorded. The stain should then be recovered and forwarded to the laboratory for examination.

Examination of the trunk also follows the same general procedures discussed thus far. The obvious evidence items are recorded and collected first; the trunk area is swept and then examined for fingerprints. Finally, the search for hidden items is conducted.

The area under the hood generally produces less physical evidence than any other part of a vehicle. However, a careful examination should be made for concealed tools, weapons, drugs, etc. The search should include the area around the inside of the grill, the area around the radiator, and any containers attached to the fenders inside the motor compartment.

If the vehicle is suspected as a hit-and-run auto, the undercarriage should be carefully examined for fibers, hair, blood, and human tissue. Standards of grease and road grime should also be collected from the underside of the vehicle.

If areas of damage were noted on the exterior of the vehicle, paint sample standards should be recovered from each damaged area, placed in separate containers, and sealed. Pieces of broken metal, glass shards from a broken headlight, or other broken items are removed to avoid further damage and then are carefully packaged for transport to the laboratory.

Search of a Victim

The search at the crime scene of an injured victim will be very limited and will usually consist only of a quick observation of his dress, general condition, and the nature of his wounds or injuries. In some situations even this much cannot be done.

In the case of a deceased victim, the search at the scene will necessarily be detailed. Before the body is moved, even slightly, its position and all pertinent information concerning its discovery should be recorded in detail. It is photographed to show its relative position and then photographed in close-up to show details of any wounds or injuries, and positions of apparent evidence items with respect to the body. Measurements are taken and sketches are drawn.

After these details have been recorded, the detail search may begin. The body should be examined carefully for minute items of evidence such as hair and fibers, paint, or glass chips.

For purposes of thoroughness, it is best to start the search with the top of the head and then proceed down one side of the body, one leg to the foot and the soles of the shoe--then repeat the process. Particular care should be taken to spot hairs or fibers clinging to the clothing or attached to the fingernails. In order to see hairs or fibers, it is frequently necessary to view the silhouette of the body against the light.

It is of first importance that the position of the evidence on the body be precisely recorded. The quality of trace evidence is frequently determined as much by where it was found as by what it is. Thus, glass slivers found in the cuff of the right trouser leg should be recorded so as to show all that detail.

It is usually not good procedure to take elimination fingerprints of the victim at the crime scene. Similarly, the fingernails should not be scraped in the field. The constraints of wind and weather and the possibility that rigor mortis will have occured, pose too many problems. Therefore, such tasks are better done at the morgue. To protect the hands from contamination, paper bags are placed over them and tied or fastened securely at the wrist. Plastic bags are not desirable because they cause condensation that can be detrimental to some forms of trace evidence.

Upon completion of the detailed search of the body, it may be removed to the morgue for further examination. (As noted earlier, the area under the body should be examined in detail immediately after it is moved.) A police officer should accompany the body.

The medical examiner is in charge of the body and associated evidence items until he has completed his examinations and released it for further disposition. Therefore, the investigating officer must key his own examinations and actions to the medical examiner's policies until the body has been released.

Actions by the Investigating Officer at the Hospital or Morgue

The officer who responds to the hospital to interview the victim should collect, or make arrangements to collect, items of physical evidence and certain evidence standards which may be needed in the investigation. For example, when there apparently was physical contact between the suspect and the victim, the victim's clothing should be recovered, the items wrapped separately and marked by the investigator. If any victim reported having clutched or slapped at the suspect, fingernail scrapings should be collected.

If a victim was injured in such a way as to cause bleeding, a sample of the victim's blood should be obtained for typing by the criminalistics laboratory. This should be done even if the pathologist will run extensive blood tests. If blood is involved, the crime laboratory will want to run its own tests. The nature and the exact location of any of the victim's wounds or injuries should be ascertained from the examining physician. Arrangements should be made to photograph bruises suffered by the victim. Such photographs should be taken as soon as possible because bruised areas tend to change appearance rapidly.

Before removing a cadaver from the scene, it should be placed in a disposable body bag. The principal reason for this is to ensure that physical evidence is not lost, and that cross contamination of the evidence on the body does not occur during transport to the morgue.

In the case of a deceased victim, the search of the body is continued at the morgue, usually with the assistance of the pathologist performing the autopsy. However, an officer or investigator who is apprised of all details of the crime and the crime scene should also be present. It is important that the investigator remain during the autopsy, making notes of the cause of death, depth and general nature of the wounds, and other contributing factors as described by the doctor. The pathologist's estimate of the time of death should be noted.

Before undressing the deceased victim, the clothing and hands should again be examined for trace materials. The lighting is usually better at the morgue and quite often material missed in the field is discovered during this additional search.

The body is then undressed. Cutting of garments should be avoided if at all possible. If a cut must be made, bloody or other stained areas and points of obvious damage, particularly points of entry of bullets or weapons, should be left as they are. Garments should not be shaken out. If a garment is wet or blood soaked, it is best laid out flat to dry naturally in a ventilated space at room temperature. It may be wrapped in clean paper as long as one wet area is not allowed to come in contact with any other surface of the garment. Each item of clothing is wrapped separately. Damp garments should never be put in a plastic bag because rapid biological change will almost certainly result.

Once the victim is undressed, the body is again examined. All marks or wounds are recorded or the original record of the wounds verified. A wound chart, such as shown in Figure 5, is useful in making an accurate record. Close-up photographs of wounds should be taken. A ruler should be included in the picture to indicate scale.

Head and pubic hair samples are collected if the nature of the case requires. These are placed in a clean piece of paper, carefully folded, and then sealed into a clean envelope which is marked with all necessary information.

If rape is suspected, vaginal smears should be obtained by the pathologist to be forwarded to the laboratory. The swabs used should also be submitted.

Inked elimination finger and palm prints of the deceased victim are also taken at the morgue. If the hands are to be swabbed for firearm residue, that must be done before the victim is fingerprinted. If the body was found without shoes, inked prints of the feet should be made.

Any spent slugs or other objects recovered during the autopsy will be marked by the pathologist and released to the investigator for packaging and transmittal to the crime laboratory.

WOUND CHART

(Showing Example Use to Locate Bullet Wound In Forehead)

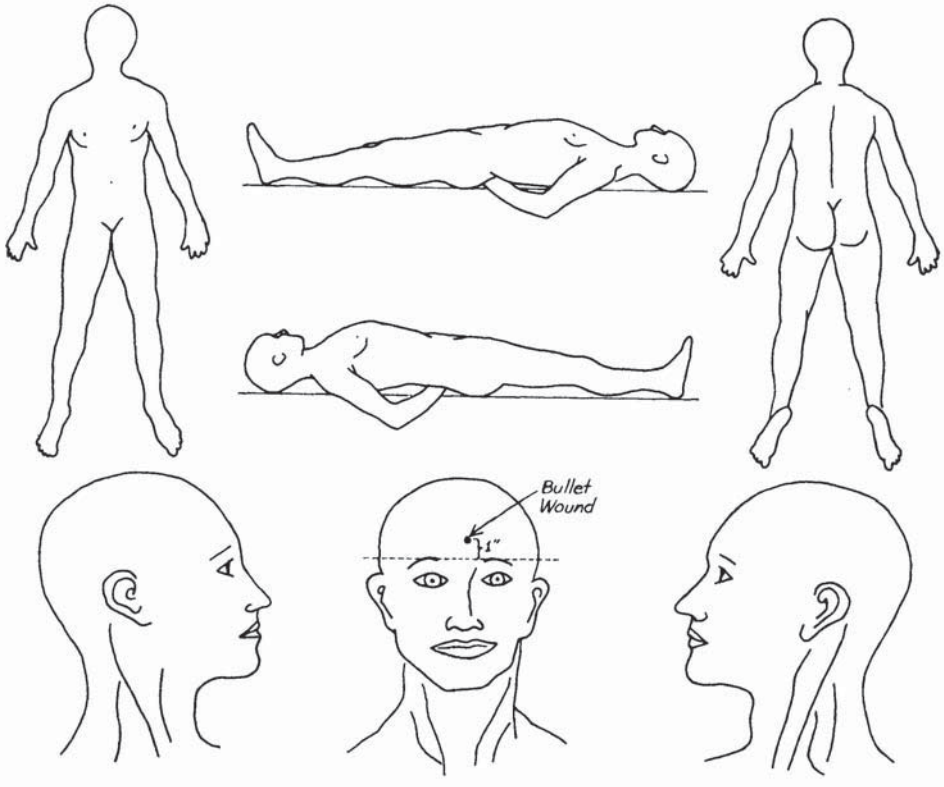


FIGURE 5

Search of the Uninjured Suspect

It is important when searching a suspect to take custody of the clothing he was wearing when arrested. If a long period of time has passed since the commission of the crime of interest, the recovery of the shoes may be all that is necessary. However, if the clothing the suspect is wearing at the time of his arrest is believed to be the same worn when the crime was committed, all of it should be sent to the laboratory for examination. Each clothing item, including the shoes, should be handled carefully and wrapped separately.

Following collection of the suspect's clothing, and if the circumstances of the case so indicate, the following evidence should, if at all possible, be collected for forwarding to the criminalistics laboratory.

- Samples of the suspect's blood and hair.
- Fingernail scrapings.
- Firearm residue, if appropriate.
- A full set of fingerprints and palm prints. If prints or impressions of bare feet were discovered at the crime scene, a set of inked footprints of the suspect should also be taken.

If warranted, this individual search of the suspect may be amplifed by a search of his automobile and residence, using the techniques already discussed.

CHAPTER V

DETAILED PROCEDURES FOR RECORDING THE CRIME SCENE

INTRODUCTION

As noted in the earlier discussions, a detailed record of the crime scene and of the actions taken during the search of it help the investigator to accurately recall events and to identify evidence items later in court. The notes and sketches made by the investigator during the search also serve as a valuable reference concerning details uncovered during the search and the thoroughness of the method. This chapter discusses three common means of recording the crime scene: note taking, sketching and photography.

NOTE TAKING

The investigating officer's notes are his personal and most readily available record of the search. It is common to rely on the memory of associated events to give cryptic notes or single words their full meaning. No rule can be expressed concerning the detail the investigator's notes should reflect. However, the objective should always be to make notes that will remain fully meaningful even months after the event. Very often, a note that is completely clear to the writer a short time after being made later becomes unintelligible.

The notes should begin with the investigator's assignment to the case and continue through the completion of the investigation. They should, of course, be supplemented by photographs, sketches, and scale drawings, as applicable. Notes are recorded in the order that the observations they pertain to are made. Thus, the sequence of the investigator's notes will not necessarily be in logical order. At this stage of the recording process, it is important only that the notes are complete. The investigator will later reorganize the information during the writing of his formal report.

The following are the essential items of information to be included in the investigator's notes. However, the listing is not intended to represent all of the categories of data that may be useful and which may be recorded:

- Dates, times, and locations. The date and time of the investigator's assignment to the case should be noted, as well as from whom and by what means the assignment was received. The exact time of arrival, exact location of the crime scene, light and weather conditions, the names of officers contacted, and names of other persons on the crime scene at the time of the investigator's arrival should be noted.

- A detailed description of the victim and his clothing. The name, age, height, weight, complexion, color of hair and eyes, and, when possible, the social security number and the date of birth of the individual are included. Outer garments should be described in terms of the type of garment and color.

- Wounds the victim has received. Information should include the exact location of a wound or injury, its type, size, and, in the case of a bruise, its color. As an example, an entry describing a gunshot wound to the forehead may be made as follows: "Gunshot wound 1/4 inch in diameter in line with the center of the nose and 1 inch above the eyebrow line. A dark grey circle 1/2 inch wide appears around the wound's outside edge."

- A general description of the crime scene. The investigator should note any damage to items, any apparent disturbance of the normal arrangement of furniture or other objects, and the presence of objects that seem unusual in the context of the scene.

- The type camera and film used in photographing the crime scene. As each photograph is taken a note should be made that includes the "f" stop of the camera, shutter speed, distance focused, direction in which the camera was faced, flash, if used, object or area photographed, and the time the photograph was taken. An example entry might be:

  "#1--f22, 1/100., 15 ft., N.E., flash: showing hallway from backdoor to bedroom where victim was found. 0902 hrs."

  The disposition of the film, that is the place it was sent for processing, should also be noted.

- The discovery of each significant item of evidence. This entry should include the description of the item, the time it was discovered, by whom, the exact place of its discovery, how it was marked, the type container it was placed in, how the container was sealed and marked, and the disposition of the item after it was collected. An example entry of this type might be:

".38 Cal. S & W Chief, revolver, blue steel frame and barrel with wood grips, 2" barrel, Ser. #23653, 36" from N. E. corner of bedroom, 43" W. of N. edge of E. door. Marked JD on inside of cylinder hinge, placed in a small evidence bag, sealed with tape, marked, #6 JD 6/6/71 at 0923 hrs. Released to Officer John Brown, laboratory firearms examiner, 1400 hrs. 6/6/71 JD."

- The failure to locate items. This entry includes the absence of items that would normally be associated with the crime being investigated, the area of the crime scene, or with any deceased victims. An example of such an entry would be that concerning an item of clothing missing from the victim's body that could not be located at the scene of the crime.

Use of the Investigator's Notes

As every investigating officer knows, notes are valuable, not only as an aid to accurate recall of events to be testified to in court, but also to furnish the raw material for his written report of the case. It is important to recognize that the formal written report of the investigation may not require the level of detail or items of information that may arise in the process of the officer's testimony. The details recorded during the investigation should anticipate both the written report requirement and the possibility of the officer being questioned on a given point by attorneys or by the court.

A seemingly minor point, but one which has on occasion caused difficulty, is the type of notebook used. Unless a different notebook is to be used for each case, a looseleaf notebook is preferable to a bound notebook. If notes from several investigations are included in the same book, and the book is subsequently examined in court, there is a possibility of unauthorized disclosure of information concerning matters not being dealt with in the case being heard. If a looseleaf notebook is used, the pages applicable to a case can be removed and the possibility of unauthorized disclosure of facts relative to other cases is avoided.

The investigator's notes should be kept permanently in a safe place. They constitute a record that may later prove valuable. Even if the criminal is convicted and sent to prison, there is always the possibility that an appeal or some other civil action will require the officer's reappearance in court.

The discussion has thus far assumed that the officer will make a written record of his actions. However, in major cases where the amount of physical material is large and the search of the crime scene very lengthy and involved, a portable tape recorder may prove valuable. By taping observations and findings, the investigator can include more details in his notes. One disadvantage of recording notes is the greater difficulty the investigator would have in consulting the recorded transcript. In all cases, the tapes should be transcribed into a written record so that the investigator may carry it into court and use it more readily.

SKETCHING THE CRIME SCENE

Sketches properly prepared may be used during the questioning of persons, in preparing the report of investigation, and in presenting information in court. The sketch complements the photographs and notes made during the crime scene search. The sketch combines the inherent communications advantage of any illustration with the additional advantage that unnecessary detail can be eliminated in order to portray the most essential elements of the crime scene and their relationships. There are several techniques that may be used to establish the location of evidence and other important items on a sketch. However, it is important to remember that the purpose of the sketch is to portray the information accurately not necessarily artistically. It is therefore not required that the investigator have any artistic ability in order to construct an adequate sketch of a crime scene.

Information To Be Included in the Sketch

There are several items of information that are considered essential in a crime scene sketch. These are discussed below. However, as with note taking, such a list should not be taken as comprehensive and certainly not as restricting the investigating officer's judgment as to what he can include. The major constraint on detail in sketching is that the result must be completely intelligible to the viewer without detailed study. If too much detail is included, the major advantage of the sketch over the photograph is lost.

The sketch then should include at least the following information:

- The investigator's full name and police rank.
- The date, time, crime classification, and case number.
- The full name of any person assisting in taking measurements.
- Address of the crime scene, its position in a building, landmarks, and compass direction.
- The scale of the drawing, if a scale drawing has been made.
- The major discernible items of physical evidence and the critical features of the crime scene. The location of such items is indicated by accurate measurements from at least two fixed points, or by other methods discussed below.

- A legend or key to the symbols used to identify objects or points of interest on the sketch. Color may be used to distinguish objects or features; however, the use of several colors can become confusing and may complicate the reproduction of the sketch.

Some General Considerations Involved in Crime Scene Sketching

It is important that measurements shown on the sketch be as accurate as possible and that they be made and recorded uniformly. If one aspect of the sketch is accurate, such as the dimensions of a field in which a body was found, and the positon of an object within the field is only roughly estimated, the distortion thus introduced renders the sketch relatively useless. It is important that the coordinate distances of an item in the sketch be measured in the same manner. For example, one coordinate leg should not be paced and the other measured with a ruler. It is also a mistake to pace off a distance and then show it on the sketch in terms of feet and inches. Such an expression implies a far greater degree of accuracy than the measurement technique could possibly produce. If the point arose in court, such imprecision could significantly detract from the value of the sketch.

Steel tapes are the best means of taking measurements in a criminal investigation. An erroneous measurement on a drawing, once discovered, is exceptionally difficult to explain, and can frequently introduce doubt into the minds of others as to the competence of the entire crime scene search.

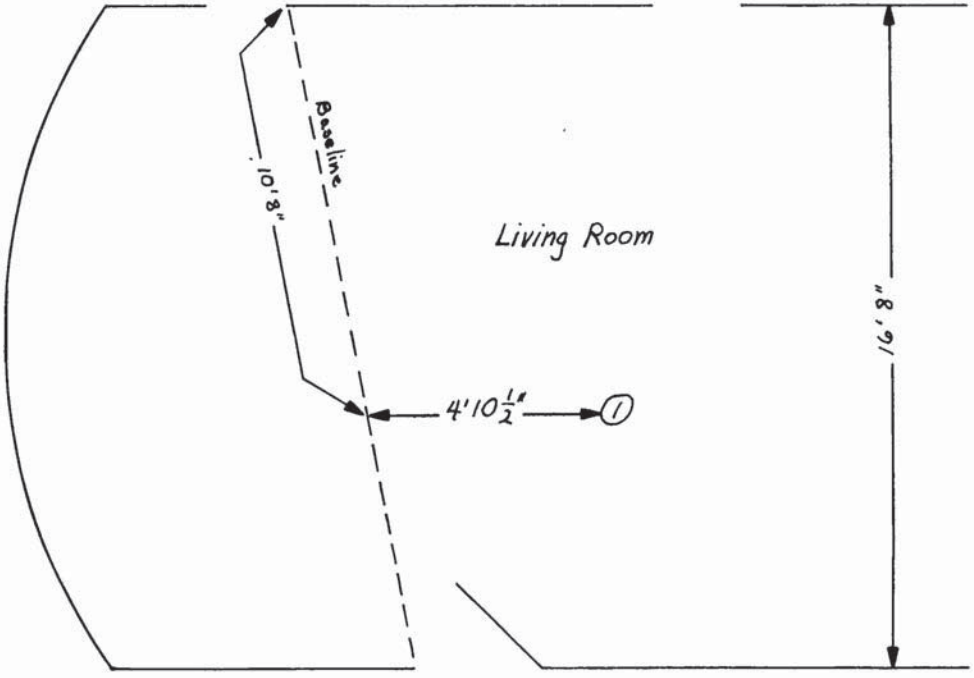
Sketching Methods

This section deals with various techniques which can be employed to prepare sketches, and particularly the methods that may be used to establish the location of evidence and other important items.

Coordinate Method

This method uses the principle of measuring the distance of an object from two fixed points. One form of the coordinate method involves the use of a baseline which is drawn between two known points. The baseline may also be a wall or drawn as a mathematical center of a room, the exact dimensions of which are known. The measurements of a given object are then taken from left to right along the baseline to a point at right angles to the object which is to be plotted. This distance is indicated in the legend with a parenthetical number following the name of the object. Figure 6 illustrates this method. Figure 6 also represents the simplest form of a sketch, namely the two-dimensional presentation of the scene as if viewed directly from above, and using numbers keyed to descriptions of the items that are located in it.

EXAMPLE OF BASELINE OR COORDINATE METHOD OF SKETCHING



LEGEND
(1) Revolver, S+W, .38Cal; Ser # 984210

8/10/71 1118 Hrs.
Burglary, John L. Doe Residence
1st Floor Living Room
1118 Birch Avenue
Kansas City, Mo.
Measured and sketched by
Sgt. John Smith, KCPD

A baseline is used here, anchored on the window edge and the door jamb, because the near (west) wall is not straight. If the west wall were straight it could be used as the baseline.

FIGURE 6

Triangulation Method

This method, illustrated by Figure 7, is particularly useful in the outdoor situation where there are no easily identifiable edges of fields or roads for use as reference points. Two or more reference points are located. These should be widely separated, if possible. The item of interest is then located by measuring along a straight line from the reference points.

Cross-Projection Method

Cross-projection in sketching is useful when the items or locations of interest are on or in the wall surfaces as well as elsewhere in an enclosed space. The walls, windows, and doors in a cross-projection sketch are drawn as though the walls had been folded flat on the floor. (See Figure 8.) The measurements from a given point on the floor to the wall are then sketched.

"Rough" and "Smooth" Sketches

The rough sketch is the one drawn by the investigator at the scene of the crime. Changes should not be made in the sketch after the investigator has left the scene. The sketch will normally not be drawn to scale, but will indicate accurate distances, dimensions, and relative proportions. In order to eliminate excessive detail in one sketch, it may be necessary to draw more than one. For example, one sketch may be devoted to the position of the body of the victim and one or two of the more critical evidence items. Additional sketches might depict the lay of evidence items with respect to the point of entry or other critical areas. Any paper may be used in constructing the rough sketch; however, the plain, unlined, or graph paper is best. It can be placed on a clipboard large enough to form a smooth area for drawing. The investigator should have available:

- One 50-foot steel tape.
- Several thumbtacks to hold one end of the steel tape down when the investigator is alone.
- One straightedge.
- One 8- or 12-foot tape for measurement from a baseline.

The investigator may add as many items to these basic requirements as he needs. For example, a magnetic compass is useful; however, normally it is not essential.

The smooth sketch is simply one that is finished. It is frequently drawn to scale from the information in the rough sketch. By constructing a scaled drawing, the numbers concerning distances can be eliminated. If the smooth sketch is not drawn to scale, naturally

THE TRIANGULATION SKETCHING METHOD

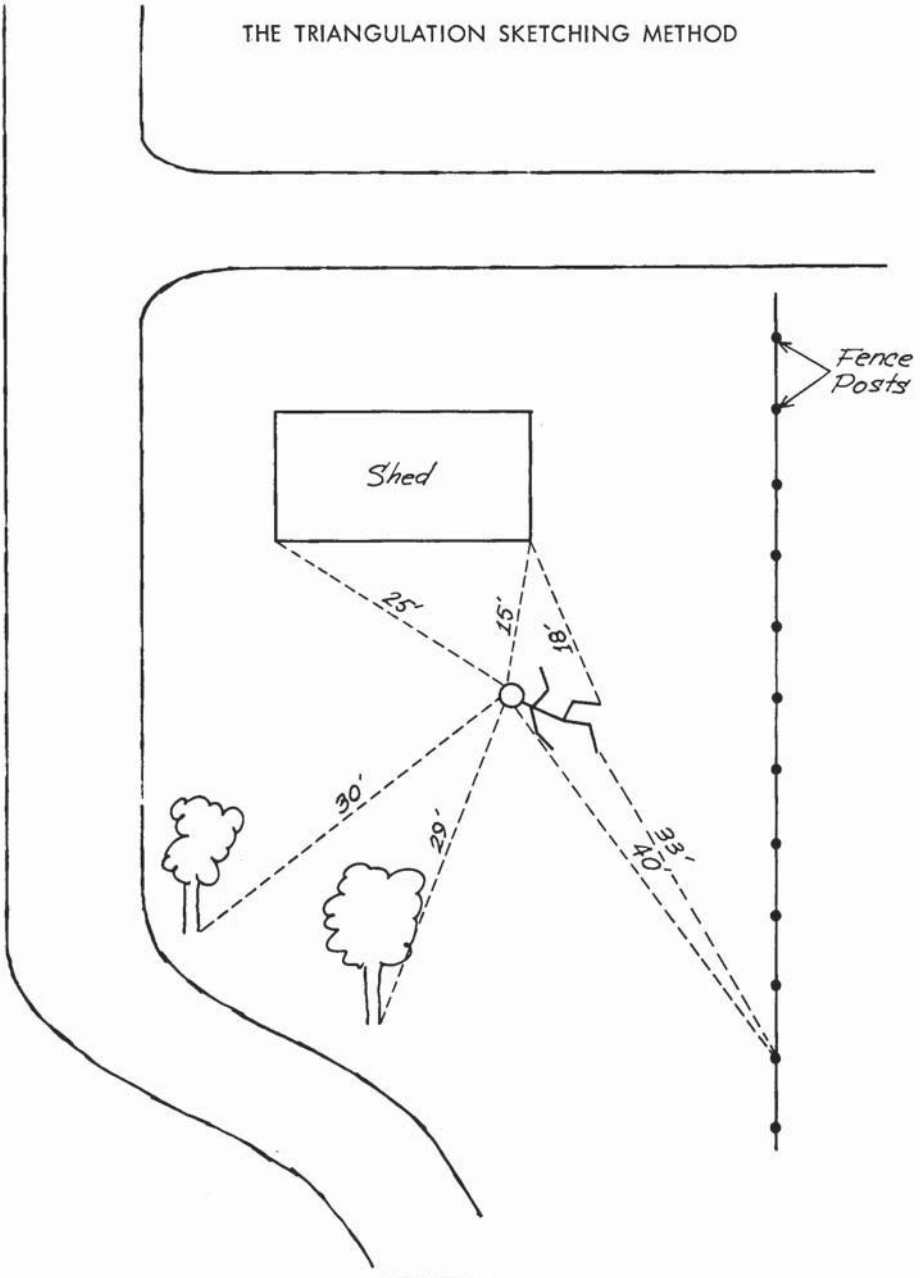
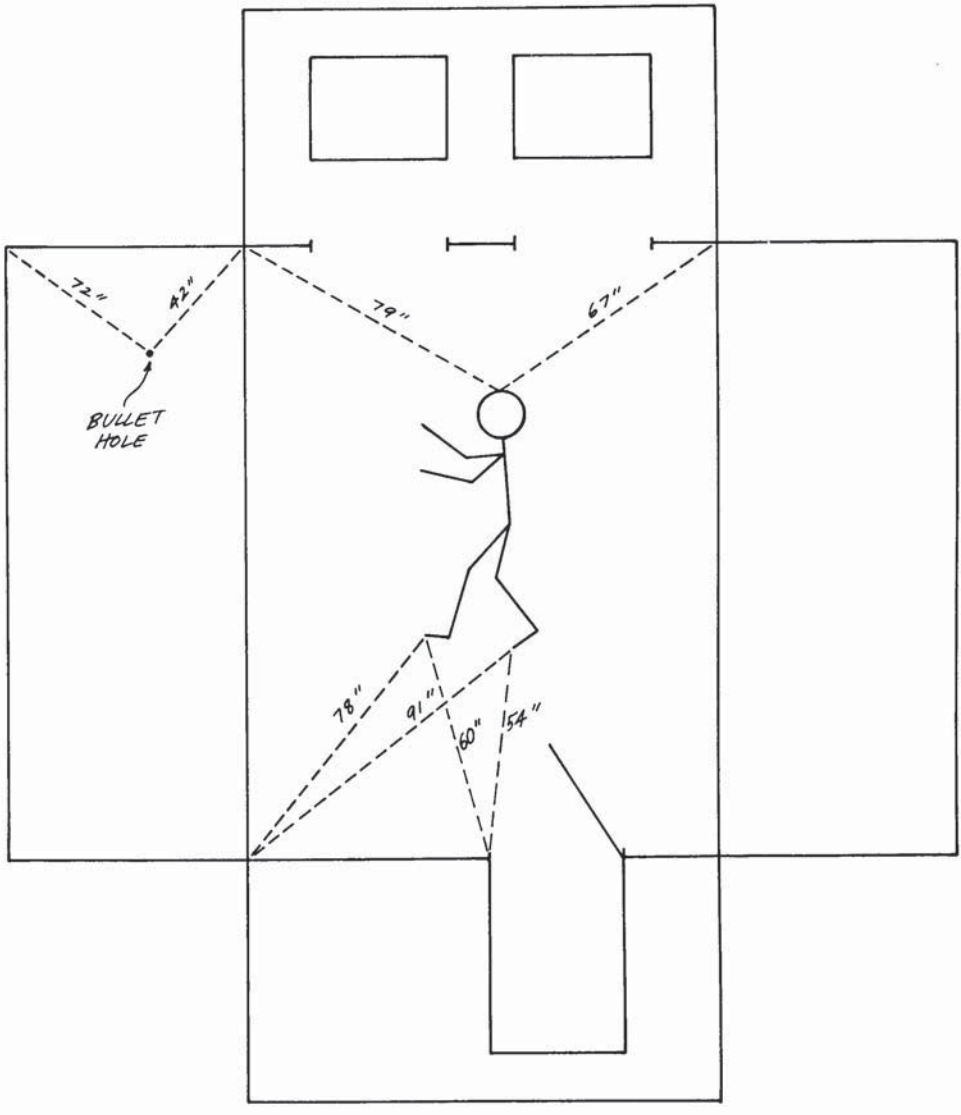


FIGURE 7

THE CROSS PROJECTION SKETCH METHOD



Note that in this type sketch the walls are drawn as if folded flat

FIGURE 8

these distances must be shown. A smooth or finished sketch need not be prepared by the investigator who drew the rough one, but the investigator must verify the accuracy of the final product. It is recommended that a finished sketch be prepared by an experienced draftsman.

External Wound Chart

None of the methods discussed above are used to record the position of wounds on a victim. To record wounds, the external wounds sketch or chart is employed. An example of such a chart is shown in Figure 5, on page 30.

PHOTOGRAPHING THE CRIME SCENE

The hackneyed statement that "a picture is worth one thousand words" may or may not be tru . However, it is certain that photography, properly performed, can be one of the most valuable aids to the police investigation. Good crime scene photography can be properly done without great expertise. This section presents a summary of the techniniques and considerations bearing on comprehensive crime scene photographic coverage. The techniques involved in operating cameras and associated equipment is, however, outside the scope of this handbook.

Investigative Photographs

These are simply any photographs made to record an object or event, or to clarify a point that is relative to a matter under investigation. Many investigative photographs are made in the photographic laboratory. However, this chapter is concerned with those taken on the crime scene.

Admissibility of Photographs as Evidence

Photographs are admissible in court if the investigator can testify that they accurately depict the area he observed. The accuracy of the photograph always relates to the degree it represents the appearance of the subject matter as to form, tone, color (if applicable), and scale. Thus, the use of a lens that will record with accuracy all objects and areas in focus may not portray correct distances between objects, nor reproduce them with the proper perspective, when they are out of focal range. In such situations, the crime scene sketch and the investigator's notes play strong supporting roles.

Usually a photographic negative is considered sufficient proof to refute any allegation that a photograph has been altered. However, if enlarged photographs are made for presentation in court, a contact print without borders should also be made.

Because of the importance of scale, distances, and perspective in interpreting the photographs taken at crime scenes, it is good procedure to include a ruler or other scale measurement in the photograph, when this is practicable. However, because some courts have not allowed even this minor modification to the scene, an identical photograph without the scale indicator should also be taken.

If the photograph is to have the highest quality as evidence, it must depict the scene, persons, or objects precisely as they were found. Photography must therefore be an exclusive function of the crime scene search--that is, no people should be working within the scene at the time it is photographed nor should extraneous objects, such as police equipment, be included in the pictures.

Identification of Photographs

The photograph must be precisely identified, and the identifying data must be noted as each shot is taken.

The information relative to the technical history of a photograph will be recorded in the investigator's notes, which become part of the permanent record of the case.

Custody of Photographs

Custody of investigative photographs should be carefully maintained. When the film is sent by mail to a commercial processor, registered mail with return receipt should be used.

General Considerations in Field Photography

Time is an essential factor. Photography frequently will preempt other aspects of the investigation. Objects cannot be moved or examined with thoroughness until they have been photographed from all necessary angles. Because there are situations in which the object of interest undergoes significant change with the passage of time, it is very important that photographic equipment be in a constant state of readiness.

All camera positions should be recorded on the crime scene sketch. This can be done by measuring the distance from immovable objects to a vertical line extending downward from the camera lens. Photographs of interior scenes, intended to depict the area as a whole, should be taken as overlapping segments in one direction around the room or area. In making such photographs, it is best to keep the camera at about eye level, unless a tripod is used.

The most important element in police photography is maintaining perspective. Proper photographic perspective produces the same impression of relative position and size of visible objects as the actual objects do when viewed from a particular point. Any significant distortion in the perspective will reduce, or destroy altogether, its evidentiary value.

As a second rule, natural perspective can best be maintained by shooting pictures with the camera aimed so that a 90° angle is formed with opposite walls, or if outdoors, with fixed objects such as trees or the landscape.

Critical Photographic Requirements

- Approaches to the scene.
- Surrounding areas (the yard of a house in which the homicide occurred, the general area surrounding an outdoor crime scene, and so forth).
- Close-up photographs should be taken of the entrance and exit to the scene, or those most likely to have been used if these are not obvious.
- A general scenario shot showing the location of the body and its position in relation to the room or area in which it was found.
- At least two photographs of the body at 90° angles to each other. Camera should be placed as high as possible pointing downward toward the body.
- As many close-ups of the body should be taken as needed to show wounds or injuries, weapons lying near the body, and the immediate surroundings.
- After the body is moved, and after the removal of each item of evidence, the area underneath them should be photographed if there is any mark, stain, or other apparent change.
- All fingerprints which do not need further development or cannot be lifted should be photographed. Areas in which fingerprints were discovered are photographed to show the location if this area was not included in other photographs.
- Bloodstains, including locations. Color film is desirable, although not absolutely necessary. Black and white pictures must also be taken.

Photographing the Arson Scene

When photographing the arson scene, complete coverage of the damage is important. But perhaps of even greater importance are objects or areas that are suspected to have been the point or points of initiation of the fire. Close-up photographs should be made of all such objects or areas. In addition, there are several other critical points or items of interest in an arson scene that should be photographed:

- Exterior views of all structures involved in the fire.

- Interior views that give a complete representation of the damaged areas and any undamaged areas immediately adjacent.

Photographing the Burglary Scene

The photographic requirements already cited for the homicide scene apply to the burglary situation. In addition, particular attention should be paid to:

- The interior and exterior of the building.

- Damaged areas, particularly those around the points of entry and exit used by the criminal.

- Close-ups of damaged containers that were the target of the burglar--safes, jewel boxes, strong boxes, etc.

- Tool marks both close up and from a perspective that will allow the position of the mark with respect to the general scene to be noted.

- Fingerprints. Although fingerprints are of major interest to all type investigations, they are of particular value in a burglary investigation. Fingerprints are photographed only when they are visible without development and when they cannot be lifted after they have been developed.

Photographing the Vehicle Accident

The accident scene should be photographed as soon as possible after the incident. Normally, except when photographing vehicles, the lenses should be of a normal focal length. If any lenses of an unusual length are used, considerable distortion will occur in the relative width of roads, distances between points, and so forth. Therefore, if special lenses were used, the record of the search should note the fact, and their description.

The following are the more critical aspects of interest to be photographed:

- The overall scene of the accident--from both approaches to the point of impact.

- The exact positions of the vehicles, injured persons, and objects directly connected to the accident.

- All points of impact, marks of impact, and damage to real property.

- All pavement obstructions and defects in the roadways.

- Close-ups of damage to vehicles. One photograph should show the front and one side, and another should show the rear and other side of the vehicle.

- Skid marks. If possible, photographs should be taken before the vehicle has been removed and again after it has been moved.

- Tire tracks, glass, and other associated debris.

Photographing Deceased Persons

The evidentiary value of a photograph of a deceased person is often considerably reduced by the inclusion of views that can be later alleged to be deliberately inflammatory. The unnecessary exposure of the sexual organs is a frequent case in point.

When photographing a body that is lying in a horizontal position, the camera should be placed directly over the victim's head at a height of no less than 5 feet.

Close-up photographs taken of injured parts of the body are most effective if in color, but black and white pictures must also be taken.

If the presence of wounds, blood, or other discoloration on the corpse may affect identification, the use of a lens filter may create more lifelike tones and thus aid in identification.

Photographing Live Victims and Suspects

Photographs that show areas of the body which usually are not visible when the person is clothed should be taken only under the direct supervision of the examining physician whose testimony the photographs are intended to illustrate. Thus, it is unusual that this type of photograph will be taken on the crime scene.

Before photographing any part of the female body normally covered by clothing, written consent of the subject must be obtained. If the subject is a minor, the written consent of the parent is needed and the photography must be done with witnesses present.

Photographing Fingerprints

To this point, the general requirement for close-up photographs of latent prints has been considered; however, it is important to consider also the uses that can be made of photography in the preparation and presentation of fingerprint evidence.

Fingerprints found at crime scenes may frequently be photographed and an enlargement produced that can be very useful in studying the print and comparing it with others. Fingerprints that can be seen without the aid of dusting powder should be photographed prior to dusting. There is always danger of damaging the print during the dusting process

CHAPTER VI

FINGERPRINTS

IMPORTANCE OF FINGERPRINTS AS PHYSICAL EVIDENCE

Fingerprints are perhaps the most common form of physical evidence, and certainly one of the most valuable. They relate directly to the ultimate objective of every criminal investigation--the identification of the offender.

Fingerprints of the offender are frequently found at the scene of a crime, and they may take more than one form. However, in all cases, the prints are fragile and susceptible to complete destruction by the first careless act. They are also, in many cases, difficult to find. This chapter discusses the basic requirements for conducting a successful search for fingerprints, together with the means of recognizing, lifting, and preserving them for later analysis.

With but a few exceptions, everyone has fingerprints. This universal character is a prime factor in the establishment of a standard of identification. Since a print of one finger has never been known to exactly duplicate another fingerprint (even of the same person or identical twin) it is possible to identify an individual with just one impression. The relative ease with which a set of inked fingerprints can be taken as a means of identification is a further basis for using this standard. Despite such factors as aging and a variety of environmental influences, a person's fingerprints have never been known to change. The unchanging pattern thus provides a permanent record of the individual throughout life.

Although there are many different filing systems for fingerprints, each is based on classification of common characteristics. The classification system works to readily categorize a set of fingerprints, as well as to provide quick access to a set of prints with a given characteristic.

DEFINITION OF FINGERPRINTS

A direct or inked fingerprint is an impression of the ridge detail of the underside of the fingers, palms, toes, or the soles of the feet. This is contrasted with a latent print, which is an impression caused by the perspiration through the sweat pores on the ridges

of the skin being transferred to some surface. Fingerprints also occur as residues when the finger ridges have been contaminated with such materials as oil, dirt, blood, and grease.

BASIS OF IDENTIFICATION OF FINGERPRINTS

The ridge detail of fingerprints including ends of ridges, their separations, and their relationship to each other constitute the basis for identification of fingerprints. The basic points of comparison of prints are shown in Figure 9. In checking for similarity, most experts require from 10 to 12 points although there is no specific number required. However, regardless of the points of similarity, should an unexplainable difference appear, positive identification cannot be made.

There is no set print size requirement for positive identification. The only requirement is that the print be large enough to contain at least 10 to 12 points. This requirement count may be met by an area as small as the end of a pencil. As a general rule, if the investigator develops an area which appears to have several ridges, regardless of the size of the area, it should be lifted, marked, and submitted to the laboratory.

Some investigators believe that the points used for identification of the fingerprint occur only in the pattern area of the finger. This is not true. All the different types occur outside of the pattern area on the finger as well as on the first and second joint of the finger and the entire palm of the hand. They are also present on the toes and the entire sole of the foot. In fact, they may be found in any area where friction ridges occur.

LIMITATIONS OF LATENT PRINTS

Even though latent prints are invaluable in the course of investigative work, there are certain limitations as to what information these prints can be expected to provide. It is impossible, for example, to determine the age of the latent print because there are a number of factors other than time that change the appearance of the developed latent. It is sometimes possible, however, to estimate the age of the print in relation to certain events. For example, prints appearing on an object thoroughly cleaned during a recent housecleaning can be dated as occurring after that event.

Likewise, it is not possible to determine, from the examination of the print alone, the age or sex of the person leaving the print. Even though a rough correlation does exist between age and sex and such characteristics as size of the ridge or pattern, individual variations occur.

BASIC FINGERPRINT COMPARISONS

Photo: KCPD

FIGURE 9

Prints cannot be used to identify the race of a suspect, nor can occupational groups be determined with an accepted degree of accuracy on the basis of fingerprints. It is true that many occupations, such as bricklaying, cause certain characteristic damage to the skin of the fingers and hands. However, any conjecture as to occupation of a suspect made on this basis should be considered only as an investigative lead and not as substantive evidence.

CONDITIONS WHICH AFFECT LATENT PRINTS

The quality of latent fingerprints is affected by such conditions as the type of surface material, the manner in which the print was transferred, nature and quantity of the substance (perspiration, oils, blood, etc.) which covered the ridge surfaces, weather conditions, and, to some extent, the physical or occupational defects of the person transferring the print. The processing of prints as it relates to these conditions is discussed later under "Means of Developing Fingerprints."

The nature and the condition of the surface on which the latent print is deposited are very important. The surface must be fairly clean and smooth or the ridge detail of the finger will be lost. Such surfaces as coarse cloth, unfinished wood, grained leather, etc., are very poor surfaces for fingerprints.

Another important consideration is the manner in which the object was touched or released The ridges on fingers are very close together. Should the finger move just the distance between two ridges when touching or releasing an object, most of the ridge detail will be lost. This condition explains why most latents which are developed are smeared in the pattern area and only their ridges outside the pattern area have enough detail for identification.

There are conditions which occur that cause the friction surfaces to become completely covered with perspiration or other materials. When such materials cover not only the ridge surface of the skin, but fill the valleys as well, no ridge detail can be recorded. Prints of this type generally develop very dark and appear about the same as a print that was developed with too much powder.

The weather affects the latent print in a number of ways. The print may be dried out or washed away. Humidity will cause latent prints on paper to become smudged or even disappear. Because of the sponge nature of paper, moisture enters it from all directions and causes the ridge detail to diffuse to the extent that it will not be recognized as a print.

The more oil that is deposited with perspiration, the longer the print will last. Since perspiration is mostly water, the oil that is deposited with it will float on the surface and reduce its evaporation rate. After the water evaporates, the oil remains and becomes

quite tacky. This condition results in better development of the ridge detail when using fingerprint powder. Body oil is present on the friction ridges of the fingers as contamination from the hairy parts of the body and, therefore, may not be present in the latent print at all. When no oils are present, the water content of the deposited material is subject to the same evaporation rate as any like amount of water under the same conditions and the print will be less tacky.

RESPONSIBILITY OF THE CRIME SCENE INVESTIGATOR IN COLLECTING FINGERPRINTS

Latent prints are such valuable evidence that extraordinary efforts should be made to recover them. The investigator is strongly urged to adopt a positive attitude toward this aspect of the search, regardless of any apparent problems.

It is absolutely imperative that the crime scene investigator make a thorough search of all surface areas in and around the scene of the crime that have the potential of retaining finger or palm prints. Particular attention should be paid to the less obvious places, such as the undersides of tiolet seats, table tops and dresser drawers, the surface of dinner plates, filing cabinets, the backs of chairs, rearview mirrors (both the glass and frame) and the trunk lids of automobiles. Heavily handled objects, such as door knobs or telephones, may not yield good prints. However, they are objects that are quite likely to be touched and should always be processed.

The investigator should not assume that the offender took precautions against leaving prints or that he destroyed those he did leave. A person committing a criminal offense is usually under some stress and may be prone to oversight. If he wore gloves he may have removed them for some operation, or they may have been torn.

It is helpful to attempt to view the scene as the criminal did. Hence, such conditions as time of day, weather, and physical layout may suggest that certain surface areas should be closely examined. In conducting the examination for latent prints in a burglary case, for example, it is suggested that the investigation begin at the point of entry. For other crimes, such as rape, the point of entry takes on less importance as a source of latent prints. Whatever the nature of the crime and the particular circumstances, its reconstruction by the investigator is intended to give practical direction to the search.

Valuable aid in obtaining latent print leads may be solicited from a person who is familiar with the usual physical layout of the crime scene, such as the owner of the building or the usual occupant of an apartment. That person should be allowed to observe at least a part of the preliminary investigation and be encouraged to point out items which appear out of place or to identify objects that may have been brought in by the suspect.

Things which have permanent serial numbers attached to them, such as automobiles, weapons, and machinery require special attention. In addition to checking such items for latent prints, it is good policy to make a lift of the serial number (using fingerprint tape), as well as prints and attach both to the same fingerprint card. Such direct lifts of serial numbers prove invaluable for latter reference, particularly as evidence in court.

PRINTS WHICH REQUIRE NO FURTHER DEVELOPING

There are two basic types of latent prints that the crime scene examiner will likely encounter which do not need developing. The first of these is the visible type created after the suspect's hand has come in contact with blood, ink, paint, grease, dirt, etc., and the print transferred to some surface area. Prints made from these substances are usually distinct and should stand out to the investigator. The procedure to be used in collecting the print is to first photograph and then cover it with protective tape. The surface on which the print rests must then be transported to the crime laboratory. Common sense must rule the decision as to just how much damage is justifiable in collecting items or surface areas where prints are found.

The second type of print which requires no further developing is an impression in a soft substance such as putty, clay, or fresh paint. Again, the procedure is to first photograph the impression, then transport the object or a section containing it to the crime laboratory. If a physical transfer of the impression is not possible, it should be sprayed with shellac and a cast prepared of silicone rubber. The cast should then be identified and sent to the laboratory in place of the actual imprint.

METHOD OF DEVELOPING FINGERPRINTS

The types of surfaces from which latent prints can be lifted fall into two broad categories: those which are hard, smooth, and nonabsorbent, and those which are smooth and absorbent. The crime scene investigator must be able to distinguish between these two types of surfaces because different procedures are used to develop latent prints on them.

Before developing the print, the fingerprint brush should be cleaned and the bristles separated. This is best done by rolling the handle rapidly between the palms of the hands and letting the bristles spread out naturally.

When the fingerprint powder is stored it tends to compact and becomes difficult to handle. Before opening the container it should be turned upside down and shaken vigorously to loosen the powder.

To determine in which category a given surface belongs, it is useful to think of what would happen to a drop of water if it were placed on it. If the water would bead up (as for example on plate glass) the surface is hard, smooth, and nonabsorbent. However, if the water would soak in, as on cardboard, the surface is absorbent.

Developing Prints on Nonabsorbent, Hard, Smooth Surfaces

Prints made on nonabsorbent, hard materials will remain entirely on the surface of the object in the form of a delicate liquid or semisolid deposit. The print, mainly consisting of oil and water, expands upward from the surface which makes an ideal adhesive base for fingerprint powder.

The actual development process (illustrated in Figure 10) is begun by applying a small amount of fingerprint powder to the area to be examined, using the brush provided in the fingerprint kit. A word of caution: too much powder should not be used since an excessive amount will result in an overly darkened print in which points will be difficult to identify. The brush should just touch the powder, it is not necessary to bury it. The entire area to be processed should be covered using light, even strokes until some ridge detail begins to show. As the pattern of the ridges becomes visible the brush strokes should be directed to follow the contour lines. After all of the details of the print have been developed, the excess powder should be removed by gently brushing or blowing it away. The powder should be allowed to adhere to the wet, tacky area of the latent print but not to the surface on which the print is deposited. The print can be lifted by holding the folded or loose end of the tape with the thumb and the forefinger of one hand and the roll in the other, pulling out enough tape to cover the area to be lifted (usually about 5 or 6 inches), securing the loose end of the tape beside the print to be lifted and holding it there with the forefinger. Then the thumb should slide along the top of the tape forcing it gently down over the print. The roll, which is in the other hand, should not be released during this operation. The print is now protected. The powder used to develop the print is trapped between the tape and the surface of the object. Using care, the tape should be smoothed down over the print to force out all the air bubbles.

Once the tape has been secured, one of two procedures may be followed. If the surface would be destroyed by removing the tape, the tape may be left on and the entire object submitted to the laboratory for examination. If this is not practical, the print may be removed by pulling up on the roll end. When the tape is free of the surface, it is placed on a fingerprint card in the same manner as the tape was placed over the latent print. When the lift is secured to the card, the tape should be severed from the roll and the loose end folded up.

If the developed latent print is larger than the width of the tape, it still may be lifted by placing one strip beside another, allowing about 1/4 inch overlap with each additional strip until the desired area is covered.

METHOD OF DEVELOPING AND LIFTING LATENT FINGERPRINTS

Photo: MRI

Fingerprint brush should be cleaned and bristles separated by rolling the brush handle rapidly between the hands.

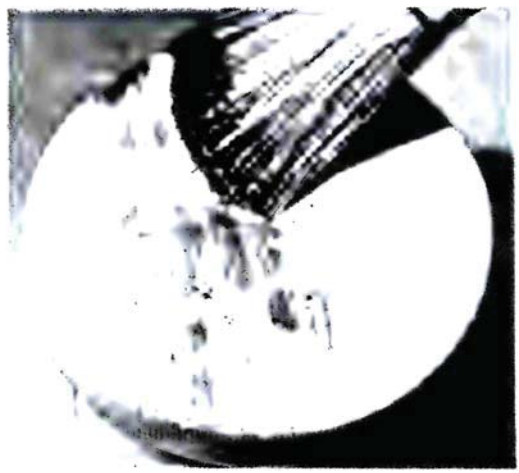


Photo: MRI

Applying powder to surface to discover the print.

FIGURE 10

METHOD OF DEVELOPING AND LIFTING LATENT FINGERPRINTS
(Continued)

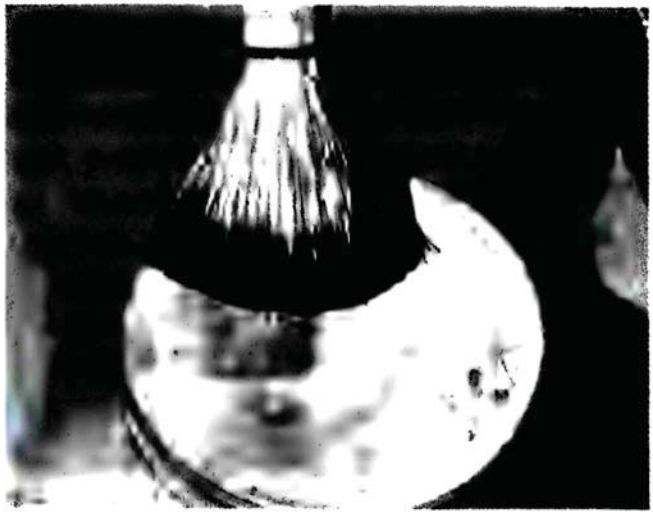


Photo: MRI

Cleaning up the print by gently brushing with the flow of the ridges.

Photo: MRI

Proper method of starting to apply fingerprint tape.

FIGURE 10 (Continued)

METHOD OF DEVELOPING AND LIFTING LATENT FINGERPRINTS
(Concluded)

Photo: MRI

Tape is smoothed with thumb to remove air bubbles.

Photo: MRI

Lifted print is transferred to a fingerprint card.

FIGURE 10 (Concluded)

Occasionally wet items, such as beer cans or glasses that have condensation on the outside of them, or automobiles which have been covered with dew, must be processed for prints. These items should first be allowed to dry under natural conditions in a sheltered area. Under no circumstances should heat lamps or artificial heat of any kind be used to dry an object.

The investigator may encounter a surface, such as glass or polished metal on which the print can be readily seen, but any effort to develop it with fingerprint powder proves useless. If a camera is available, a photograph should be taken before any further attempts at processing are made. If a camera is not available, it may be possible to rejuvenate the print by blowing on it several times and allowing the condensation on the surface to evaporate naturally. The print should then be repowdered and the lift made.

Items exposed to freezing temperatures should be allowed to warm up and dry out naturally before any attempt is made to develop latent prints.

As a general rule, it is always better to develop prints on a nonabsorbent surface and lift, or at least cover them, with fingerprint tape before transporting them to the fingerprint technician. Any friction on this type of print will destroy it. The particularly delicate nature of such prints and the problems which arise in transporting the unprotected surface to the laboratory make this imperative.

If in dusting an area only one print appears to have ridge detail and the others around it are smeared so that no ridge detail remains, the smeared ones should also be included in the same lift. Even though the smeared prints cannot be identified, they can be of great value to the lab specialist in later examinations in determining the relationship of the identifiable latent to the whole hand.

Developing Prints on Absorbent, Porous, Smooth Surfaces

No attempt should be made by the crime scene investigator to develop latent prints on absorbent surfaces with fingerprint powder. To do so, under ordinary conditions at the crime scene, usually results in failure and creates serious problems for the fingerprint specialist at the laboratory.

High humidity will destroy prints of this type by causing them to diffuse. Evidence such as pieces of paper, cardboard, etc., should be placed in a container with tweezers or handled carefully by the edges. Gloves should not be used to collect this material since they may become saturated with perspiration and damage the print on the item collected. After the items are collected, the container should be sealed and marked with all required data and also specially marked "TO BE PROCESSED FOR LATENT PRINTS."

MARKING AND IDENTIFYING FINGERPRINT LIFTS

After a latent print has been developed, lifted, and placed on a card, it is necessary that the card be properly identified. Information recorded on the card should include the date, title of the case or number, address of the crime scene, name of the officer who made the lift, the exact place of the lift, and the type of object. If the card contains only one lift, the description of the exact place and the type of object lifted from may be placed on the back. If the card contains several lifts (which is permissible), then the exact place and the type object should be written on the front of the card close to the print. Regardless of how well the latent was developed and lifted, if the card is not properly marked with all the information legally required, and if the fingerprint specialist is not furnished with all the information and detail he requires, the whole effort is a waste of time.

In describing the exact place that the lift was made, it is sometimes convenient to draw a simple sketch of the object. This sketch should be made on the fingerprint card which is sent to the criminalistics laboratory. The inclusion of corresponding small arrows on both the lift and the sketch are also helpful in orienting the exact placement of a latent fingerprint.

If prints opposed to each other are lifted, as on both sides of a piece of broken glass, a notation of this fact should be made on the fingerprint card.

COLLECTION OF ELIMINATION FINGERPRINTS

Before submitting lifted latent prints recovered from the crime scene to a fingerprint technician for examination, elimination prints of all persons who may have had access to the area should be made. With elimination prints, it is possible to exclude from the prints lifted all persons who had legal access to the crime scene.

Equipped with fingerprint ink, a glass plate, and a card holder, the investigator uses the following step-by-step procedure to obtain elimination fingerprints.

- The subject signs the fingerprint card.
- The officer signs and dates the same card.
- The subject washes his hands.
- The officer rolls ink over the surface of the inking slab.
- The officer instructs the subject to relax arm and hand muscles.
- The officer grasps the subject's hand, holds the four fingers back, and inks the thumb by rolling it toward the body. He immediately rolls the inked thumb in the designated space on the card and repeats the process for each of the fingers, rolling them away from the subject's body.

- To make simultaneous impressions, the prints are not rolled; rather the four fingers, extended and joined, are inked and the print is made by exerting a straight down pressure. The process is repeated for the thumbs (again no rolling).
- To make palm prints (needed only if palm prints were found at the crime scene), the entire palm and fingers are inked. The hand is then pressed straight down on a sequence card. A different card should be used for each hand.

If the glass plate and card holder are not available, the ink pad and the elimination cards furnished with the equipment may be used. In case of a homicide, the prints of the victim, including palm prints, must be obtained. The law requires positive identification of all murder victims. Both palm and finger prints are required as elimination prints.

If the investigating officer wishes to take elimination prints, and the equipment for taking inked prints is not available, he may use the same equipment he uses for developing latent prints. The subject's fingers are rolled on a card as though they were inked. After the card has been allowed to dry for a few minutes, the latent prints are dusted with fingerprint powder and when fully developed are covered with fingerprint tape. Both the subject and the officer should sign under a notation on the dated card that the prints are elimination prints.

CHAPTER VII

BODY FLUIDS

INTRODUCTION

In the investigations of crimes of violence, as well as those of certain property crimes, blood and other body fluids are of great value as evidence. The remains of those fluids may appear at the crime scene in liquid form or as a stain. Although laboratory analysis has not developed to the point that will allow positive identification of an individual on the basis of body fluid analysis alone, tests performed on biological materials are invaluable as a means of pointing up possible identifications and frequently allowing the positive exclusion of a person from suspicion.

A crime scene can yield, in addition to liquid blood or bloodstains, semen, saliva, urine, perspiration, pus, and human milk. Of these, blood and semen are by far the most commonly discovered. Useful results of a laboratory examination of biological materials are particularly dependent upon the purity of the sample, whether the sample collected was adequate for analytical purposes, and its timely arrival at the laboratory. The ability of the criminalist to produce meaningful findings from biological evidence is greatly dependent on the care with which the investigator collects the samples.

THE SCIENTIFIC BASIS OF BODY FLUID EXAMINATION

It is common knowledge that all persons have either blood type A, AB, B, or O. However, the same factors that make it possible to distinguish one blood type from another are present in the cells of every organ of the body, and in some persons are sufficiently present in saliva, semen, tears, urine, and perspiration to make it possible for the laboratory to determine the type using a body fluid other than blood. Blood is, of course, the best and easiest means of establishing type classification. However, if a blood sample is not available, it is necessary to attempt other procedures.

Secretors and Nonsecretors

The blood of all humans can be grouped into one of the classifications. However, not all persons have specific substances in sufficient quantity to allow their other body fluids to be grouped. Therefore, a secretor is an individual whose body fluids, as

well as blood, can be grouped. A nonsecretor is one whose blood can be grouped, but whose other body fluids cannot. Roughly 65 to 80 percent of the population are secretors and the remaining are nonsecretors.

Medical research has established that the concentration of the grouping factors in saliva and semen secretions are relatively high, and their concentration in tears, urine, and perspiration is very low. (Saliva is the most suitable material for distinguishing secretors from nonsecretors.)

Relationship to Investigations

The relationship between blood and other body fluids of secretors offers some valuable investigative alternatives. If a blood sample is not available or is so deteriorated as to make it unsuitable for analysis, typing may be attempted from another body fluid sample or stain. Although there is far less probability of success than with blood, laboratories have been able to identify type grouping from saliva stains on a cigarette butt and even from perspiration stains on a underarm protective pad.

Recent advances in the testing of dried blood, as related to crime situations, make it possible for the laboratory to go further in grouping the blood than the classic A, B, O factors. Numerous tests are now available for further subgrouping, which make it possible to assign more important probability factors to blood and seminal stain evidence. For example, certain combinations of these tests allow the laboratory to assign a probability factor to a member of the O blood group (standing by itself, 40 of every 100 people) to a group often times approaching one of 10,000 persons.

Because of these continuing advancements it is more important than ever that the laboratory receive adequate samples of the questioned dried or whole blood as well as blood drawn from the victim and the suspect.

BLOOD AND BLOODSTAINS

Forms of Blood Evidence

It is important that the investigator develop an appreciation for the many forms in which blood may be submitted as evidence, if he is to make full use of available laboratory services.

The form in which blood will be submitted to the laboratory for analysis will vary according to available crime scene evidence, the type of case, and related circumstances. One of the most frequent types of blood evidence is stains on clothing or other objects. The investigator may find a pool of blood at a crime scene and be able to take samples for laboratory analysis. Blood evidence samples may include specimens taken from

victims (dead and living) and from suspects in a case. This latter activity is properly left to medical personnel or qualified specialists.

Requests for Laboratory Testing: Laboratory Capabilities

Not only does the form in which blood is submitted to the laboratory vary, so do the reasons for considering it as evidence and the subsequent requests made of the laboratory differ in various cases. Blood in the fluid state does not always indicate the same sequence of laboratory testing. For example, a blood sample taken from a bleeding wound of a victim would normally not require the same test procedures as a sample drawn from a person suspected of intoxication. Accompanying each evidence sample sent to the lab must be a general description of what information is needed.

The laboratory can furnish the following information concerning blood samples.

	Wet Samples	Dry Stains
• Ascertain that the sample is blood	X	X
• Determine the blood species (human or animal)	X	X
• Determine the type--A, AB, B, O or further subgroups and isoenzymes	X	X
• Determine alcohol content of the blood	X	
• Whether a human blood sample was venous, fetal, or menstrual in origin	X	
• Determine presence of some drugs in the blood (Large sample only)	X	
• Possible ways in which blood was deposited on the item or material	X	X

Procedures to be Used in Searching for and Collecting Blood Samples

Any blood or bloodstains discovered by the first officer at the scene should be protected from contamination and possible loss. If blood is exposed to strong sunlight or rain, the sample should be covered with a box or metal pan.

Blood begins to clot after 3 to 5 minutes when exposed to air. As it dries, the clot darkens in color becoming reddish-brown or dark brown when completely dry. As a result of contamination with foreign substances, mold, or the onset of putrefaction, some bloodstains appear to be black, green, blue, or grayish-white instead of the usual reddish-brown. An old dried blood clot may appear black.

If the blood falls on a porous material, such as cotton, porous brick, or soft wood, the original color may be altered by the absorption of the blood into the substructure of that material. Since color does not always serve as an absolute detector of blood, the crime scene investigator must be aware of another characteristic of bloodstains. When deposited on a dull surface, such as an old wooden floor, dried blood will have a glossy appearance if examined under oblique lighting. Therefore, dried blood on a dark floor may be discerned more easily by projecting the beam of a flashlight at a low angle along the floor.

Blood should also be searched for in the less-than-obvious places. For example, few wounded suspects will wipe blood from their hands on their clothing. Towels, toilet paper, or tissues may have been used by the suspect to wipe off blood and then these may have been hidden. Even though such evidence may be hidden or partially destroyed, every effort should be made to recover it. It if is believed that the perpetrator of the crime may have washed his hands, the water in the sink trap (the "gooseneck" pipe immediately below the sink outlet) should be removed and sent to the lab. The suspect may have wiped his hands in an inconspicuous place such as under a table, on the bottom of a drawer, or on the underside of a rug. There is always the possibility that bloodstains on the floor may have been mopped up. Thus, careful attention should be given to the cracks or other recesses in the floor which may have trapped a quantity of blood.

Relating Bloodstains to Physical Activity

The shape and relative size of the stain of the victim's blood at the crime scene is useful in reconstructing the crime. It is possible, for example, to surmise if a wound on a victim occurred prior to, or as a direct result of a fall by noting the pattern of the blood deposited. Blood spot patterns resulting from injuries which are already bleeding when the victim falls or is struck will create a sunburst pattern that can be helpful in interpreting the direction of the blow received by the victim. Injuries caused by falling will usually be manifested in pools of blood having no distinctive patterns.

Shapes of Bloodstains

The shapes of bloodstains may provide as much information about the circumstances of an incident as the laboratory analysis.

Stains caused by blood drops falling straight down for only a short distance are generally smaller and thicker than drops falling straight down from greater heights. The drop may vary from a nearly circular configuration on smooth surfaces to a more or less symmetrical configuration, depending on the substrate (see Figure 11, top).

SHAPES OF BLOODSTAINS

Photo: MRI

Typical stain made by drop falling straight down onto hard cardboard. Note generally symmetrical serrated edge.

Photo: MRI

Typical stain made by drop falling at an angle due to some force other than gravity. Small end points in direction of force.

FIGURE 11

Drops which fall at an angle due to some force other than gravity, such as forward movement or the swinging action of a bloody hand or instrument, present a different appearance when they strike a surface. They leave a stain shaped like a bowling pin. If the force is great enough, the stain appears as an exclamation mark (long and slender). The small end points in the direction of the secondary force (Figure 11, bottom).

The position and shape of the bloodstain on the victim may also be useful in determining whether or not the body was moved. If the direction of flow of blood from a wound is other than that which would be produced by gravity, it can be concluded that the victim was moved. If such a situation is evident, the investigator should check with any officers who were at the scene prior to his arrival to ascertain if they moved the body.

Blood in areas which cannot be associated with the victim may be the blood of the assailant. Close examination of these stains may yield valuable information about the nature and location of the wound of the suspect. The amount of blood deposited may give some idea of the extent of the wound. Blood from wounds received during the struggle, while the parties were standing, will show some downward migration. When the suspects's alibi is self-defense, this may be a very important piece of information in proving his alibi true or false. The bottom of the victim's shoes may also help in confirming or disproving the claim.

Specific Methods of Collecting Blood and Bloodstains

All bloodstains should be recorded during the preliminary examination of the scene. Weapons which bear bloodstains should be handled carefully. Even though the blood on the weapon is known to be that of the victim, the evidence is still useful in support of the fact that it was the weapon used in the commission of the crime.

Slugs or spent bullets recovered at the scene may carry traces of tissue or blood. Even though the amount of this material is usually very small, it may help to determine if a slug passed through a body.

When the blood and bloodstains are discovered on objects which cannot be transported to the laboratory, samples must be collected by the investigator. A clean razor blade is useful to remove the dried crust of blood from an object. A new blade should be wiped to remove packing grease. An alternative method for collecting a sample from a vertical surface involves taping a clean piece of paper, which has been folded outward, below the stain, to catch the crust as it is scraped. The paper is then folded and sealed in an envelope. A sample of the unstained surface material near the recovered bloodstain should be removed and placed in a separate container along with the scraper blade and sent with the questioned stain sample to the laboratory. The laboratory will use these standards to prove that the results of the tests performed were brought about by the blood and not by the material on which it was deposited or the blade used to remove it. Small dry stains which cannot be scraped off may be removed by wiping the surface with a small piece of moist, clean filter paper. The filter paper containing the stain is then placed in a test tube, sealed, and sent immediately to the laboratory.

Blood in cracks and on hard absorbent surfaces can frequently be collected by using wet filter paper which is allowed to lay on the stained area. Often it is better to cut a strip of filter paper (about 3/4 inch wide and 4 to 6 inches long), tape one end of the strip to some upright object, such as a can or bottle, and allow the lower part of the strip to lay on the stain. A small quantity of water is then poured on the lower end of the strip of filter paper and allowed to migrate up the strip and evaporate. As the water migrates up the paper, it carries the blood with it. The strip is then removed from the upright object, placed in a test tube, sealed, marked, and forwarded to the laboratory. The exact location of all such stains should be carefully recorded.

During the crime scene search, blood may be found which has soaked into the soil. Just enough soil should be removed to collect all the blood. The stained soil is placed in a clean glass or plastic container, sealed, and marked with all necessary information. Stained soil samples should be submitted to the laboratory as soon as possible because the normal bacterial action and molds in the soil will soon destroy the value of the evidence.

Moist Blood Samples

Moist blood containing whole red cells can be grouped much faster and easier in the laboratory than dried blood, and yields more information. Wet blood may be collected with a medicine dropper and placed in a glass tube. An equal amount of normal saline is added to the blood before it is sealed. Blood samples taken from two areas are never to be mixed.

When the quantity of wet blood is very small and cannot be removed with a medicine dropper, the investigator must collect it in other ways. If the blood is on an object that can be cut or a piece removed, it is carefully recovered and placed in a container which can be sealed. When removing a stain of this type enough unstained material must be included to allow the laboratory to collect a control. The investigator may choose to allow the blood to dry and then scrape the dried material into a suitable container which can be tightly sealed.

Clothing with wet stains must be wrapped so that the stains are not transferred to unstained areas of the garment. If such transfers occur, it will not be possible for the laboratory to determine the position of the body during the time that the bleeding occurred. A clean piece of paper placed between each layer of cloth will prevent the transfer from occurring. Bloodstained bed clothing is handled in a similar manner, taking the added precaution to preserve any hair, fibers or seminal stains.

To get the maximum evidence value from blood and bloodstains, the laboratory should have a sample of blood from both the victim and the suspect. A member of the medical profession or a qualified technician should obtain the sample. Victims or suspects may be brought to the laboratory for blood grouping purposes. Samples to be used for blood

alcohol determinations are placed in a clean test tube and sealed, the required information is marked on the outside of the tube, and the tube is forwarded to the laboratory as soon as possible. The name of the doctor or technician who drew the sample should be included

SEMINAL STAINS

While seminal stains are usually associated with sex offenses such as rape, they may be present in stolen autos, at the scene of a burglary, at an arson, and at the scene of several other type crimes.

Seminal stains are fairly resistant to chemical action but they are very fragile when dry; therefore, the investigator must use special care in the collection of the dry materials.

When a sex offense occurs out of doors, the investigator should examine the vegetation and soil in the area carefully for seminal stains. They may be found on leaves or soaked into dirt or soil in the area. Where they are found on the vegetation, the plant should be removed and placed in a rigid container where it can be fastened securely to prevent any friction during transportation. The container is sealed and marked with the necessary information. Soil suspected of containing seminal fluid should be collected in the same manner as blood. A clean spoon is used to remove the soil, which is placed in a suitable clean container, sealed, marked, and forwarded to the laboratory as soon as possible.

Wet seminal stains are handled with the same precautions as wet blood stains. One stain is not allowed to touch another on the cloth or to touch an unstained area. When the stain is on bed clothing or the clothing of the victim or the suspect, precautions should be taken to prevent loss of any hair or fibers that may be present. Cloth bearing dry stains should never be folded or wadded up.

In rape cases there is usually contact between the garments of the victim and the suspect. Where such contact occurs there should be some transfer of fibers. For this reason, both the outer garments and the undergarments of the victim and the suspect are submitted to the laboratory for examination.

Before removing the bed clothing from a bed, the investigator should mark the bed clothing to show the position (head, foot, "up", side) in which it was found. Many sex offenses occur as "unnatural acts" and the location of the stain may yield valuable information about the nature of the act. The pillow cases, as well as all other bed clothing, should be examined for traces of semen, hair, and fibers.

Seminal stains will sometimes be encountered on floors or other surfaces which cannot be submitted to the laboratory for examination. In such cases, a razor blade, which has been thoroughly cleaned, should be used to dislodge the crust after it has dried.

The material should be placed in a small pill box, sealed, and marked with the proper information. The razor blade and a sample of the unstained material for a control may be sealed in a separate container and marked to be forwarded to the laboratory.

Seminal stains alone on the clothing of the male suspect are of little value. However, if the presence of a seminal stain on the clothing can be associated with other types of physical evidence, such as fibers, blood, soil and vegetation, it can be very valuable.

CHAPTER VIII

TRACE EVIDENCE

INTRODUCTION

Trace evidence can be defined as materials that are small enough to be easily overlooked by an investigator, and those that, because of their size, are easily exchanged through contact or transferred by air currents. Despite the wide use of the term, trace evidence is very loosely defined among criminalists and law enforcement personnel. Therefore, the definition just given is not represented as one that is universally accepted.

Throughout the preceding chapters, many aspects of the evidence value of trace materials have been dealt with. It is the purpose of this chapter to bring together the major considerations with respect to the collection and processing of trace evidence, and to point up the advantages and limitations associated with physical evidence that is found in very small or microscopic quantities.

Perhaps the greatest single advantage of trace evidence relates to the fact that there must usually have been contact for an exchange of trace material to have occurred between persons or things. Thus, the problem of identification is considerably simplfied when microscopic evidence linking the suspect with the crime scene is detected.

Evidence standards assume their highest importance with respect to trace materials. Without such standards, the trace materials collected from the suspect or the crime scene have little value.

TRACE EVIDENCE ASSOCIATED WITH CLOTHING

The clothing of the suspect is a prime accumulator of trace evidence. For this reason, his clothing should be collected as soon as possible after the arrest and submitted to the laboratory for examination. Such collection is particularly important when the clothing is believed to be the same worn when the crime was committed. Before removing the clothing from the suspect, a cursory examination should be made of each item to avoid overlooking an obvious piece of evidence. The location of an item may be as important as what it is.

When collecting clothing, the suspect should be made to stand on a clean piece of wrapping paper while undressing. As each item is removed, it should be carefully folded and packaged separately.

After the suspect has removed all clothing, including shoes and socks, the wrapping paper he was standing on should be carefully folded (to avoid losing any materials that may have fallen on it), placed in a clean paper bag, and forwarded to the laboratory.

A clothing item collected as evidence should never be shaken, folded or handled more than necessary. Because of the importance of location of trace evidence, special precautions must be taken to avoid not only loss of the materials, but their shifting or mixing as well.

Never place a clothing item in a plastic bag or airtight container. Any moisture in the garment will be trapped and may promote bacterial growth. If there are wet stains on the garment, it should be laid out on a piece of clean wrapping paper and allowed to dry at normal room temperature and away from any appreciable air currents. Wet areas should not be allowed to touch.

Dry garments should be packaged in a clean paper bag. If it is not possible to dry the garment before hand, it should be placed in the bag in such a way that the wet areas do not touch.

It is desirable that the suspect sign his name on each of the paper bags containing clothing collected from him.

During the search of a suspect, the pockets of his clothing should never be turned inside out, and the suspect should not be allowed to do this. The pockets, pants' cuffs, and the pleats in clothing frequently contain microscopic material of considerable evidence value. Normally, the material inside the pockets or pants' cuffs has collected over a longer period of time than that which may be found on the outer surfaces of the garment. It is, therefore, important not only to recover the trace evidence from these recesses but also to be able to specifically identify the precise area from which it was recovered. If this is not done, the value of the evidence may be lost and wrong interpretations may result from the examination of the trace materials.

Because of the critical importance of identifying the origin of trace materials and insuring that they are not contaminated, the suspect's clothing should never be allowed to come in contact with or even close to the victim or his clothing. The suspect should never be brought to the scene of the crime until after the scene and his person have been searched. The reason for this precaution relates to the possibility that the suspect may claim that hairs, fibers, or other trace materials used to identify him and place him at the scene of the crime were actually transferred or deposited at the time he was brought on the scene by the police--not during the commission of the crime itself.

There may arise situations in which it is impossible or undesirable to confiscate the clothing of the suspect. If so, the items of clothing may be temporarily removed from the suspect and swept with a vacuum. The sweepings from each of the clothing items must be placed in separate containers. Similarly, the sweepings from each pocket and pants cuff must be separately processed and packaged. The labeling of these packages must specifically identify the source of the material.

RECOVERY OF THE CLOTHING OF A VICTIM

Trace materials on the clothing of victims or suspects are particularly susceptible to contamination or loss at a hospital. Medical personnel are naturally concerned only with providing immediate treatment to the injured person and, therefore, cut away clothing from the body in order to save time. Frequently, the garments are thrown in a pile on the floor and, if not recovered quickly by the police, may even be destroyed. The investigator should make an immediate effort to have the injured person's clothing recovered for examination. In recovering such items he should use caution to prevent further damage and contamination of the evidence. However, if garments have been recovered in a pile, it is normally useless to separate them--and they may be wrapped together. When the victim's clothing has been brushed or cleaned by hospital personnel, an effort should still be made to recover them for laboratory examination. The laboratory would still be able to collect standards for comparison; and the recesses of the clothing may contain valuable trace materials.

The recovery and removal of clothing of a victim at the morgue should be carried out by the investigator or in his presence. Before any clothing is removed from the body of a deceased person, it should be examined in detail for any obvious evidence materials which may have been missed at the crime scene.

CLOTH FRAGMENTS AND IMPRESSIONS

This section is concerned with the special considerations in collecting cloth fragments and impressions of cloth in paint and other materials.

Fragments of cloth are sometimes collected as evidence at a crime scene. Any protuberances such as a nail, splinter, tree limb, or sharp edge, and particularly those in the path of the criminal's entry to the scene, may have picked up a fragment of cloth. Cloth fragments may also be found attached to any protruding part or to the under carriage of an automobile involved in a hit-and-run accident. Cloth may also have been used as wicks or "trailers" to start fires.

The impression of cloth which may be found in such soft materials as wet paint, putty, wax, and so forth, may be nearly as valuable evidence as a fragment of the material itself although such impressions are infrequently encountered. Cloth impressions are also often left on the surface of an automobile involved in an accident.

All impressions of cloth are recorded by photographing them. Photographs of cloth impressions should always include a ruler or ruled tape. If cloth impressions are compared by using two photographs, the scale of the photographs is critical in order that the prints may be produced in exactly the same size. In a few cases it may be possible to cast a cloth impression, but this should be attempted only after photographs have been taken.

Photography of evidence of this type requires that the camera be placed on a tripod and adjusted in such a manner that the film in the camera will be parallel to the impression and the ruler to be included in the photograph. The lighting of the impression may be accomplished by the use of either photofloods or the flashgun.

If photofloods are used, they are adjusted so that the light strikes the impression from the side at approximately a 45 degree angle or less. If the flashgun is used, it is removed from the camera and held in the hand in the same position. This technique enhances the detail of the impression. The side of the individual lines of the impression closest to the light source will be brighter than the side opposite the light, and details are thus picked out by contrast.

Special precaution should be taken to keep all surfaces to be photographed parallel to the film of the camera. Figure 12, a photograph of a cloth impression on the grill of an automobile, illustrates this point.

When cloth fragments are discovered, they should be recorded by the investigator before they are collected. In recording fragments the investigator should note the color or pattern of the fragment, its size and shape, and the general type of material, if known. The exact location of the fragment is also noted.

When removing the fragment, care should be taken to avoid any damage to it. If the fragment is a small one, it should be removed with tweezers and placed in a container which will not require folding the cloth. Larger pieces are carefully folded and placed in a clean paper bag, sealed, and marked with all information pertinent to the case. Larger pieces may have other material adhering to them and should not be handled more than is absolutely necessary.

CLOTH IMPRESSION ON AUTOMOBILE GRILL

Photo: KCPD

FIGURE 12

It is important that the investigator use care in recovering the fragment because the loss of a thread or even a few fibers from a thread may reduce the value of the evidence. The shape of the fragment should not be distorted when it is removed. If the piece from which the fragment came is recovered, a photograph showing that the shape of the tear corresponds on both pieces will be taken for use in court. If the shape of the fragment is distorted, this match is difficult to make and the photograph is even more difficult to take. Folding of a very small fragment is one of the frequent causes for distortion as the threads have a tendency to slip in relation to one another. With larger pieces the danger of distortion is much less.

Pieces of cloth used as wicks or trailers at fire scenes should be placed in a clean bottle or metal can and tightly sealed to prevent loss of any fuels that may have soaked into them. Plastic bags or bottles are not satisfactory for packaging any material which may have a petroleum content.

THREADS, FIBERS, AND HAIR

General

Although the value of hairs, fibers, and threads as evidence in criminal cases has been clearly demonstrated, this evidence is seldom conclusive. However, when hair, thread, or fiber traces are combined with other forms of evidence, they can become important aids to the investigator and prosecutor.

Although these three types of trace materials have physical similarities, they do not occur in evidence with equal frequency or have the same value.

Threads, which are composed of tightly twisted fibers, are perhaps the least often encountered. When threads are discovered at the crime scene or on the person of a victim or suspect, they are frequently associated with a torn part of a garment or a lost button.

Fibers, along with other materials, are usually recovered from the sweepings of a crime scene and the clothing of victims and suspects. Because fibers are very easily transferred from garment to garment, their proper collection requires certain special considerations which are discussed later in this section.

The value of hair as an evidence item in an investigation does not lie in the ability to positively identify a suspect from a hair sample, but rather in its use in narrowing the field of suspects and adding to the bulk of other evidence. The physical properties and appearance of hair are of greater concern to the crime scene investigator than its chemical makeup.

The Properties of Hair

The physical parts of a normal strand of hair are shown in Figure 13. The basic components consist of a root or proximal end, a central area called the medulla (which may or may not be present in a sample), the main shaft or cortex surrounding the medulla, the cuticle or scaly outer covering of the hair, and the tip or distal end.

Hair frequently carries valuable trace evidence. It is usually covered with a very fine coat of oil. The oily surface of the hair can thus collect trace materials. But hair may produce evidence of other types, such as samples of blood and commercial hair preparations.

Information the Criminalistics Laboratory Can Derive From Hair Sample Analysis

The examination of any of these sections of the hair may reveal some of the individual characteristics of the person from whom the hair originated. Through examination, the criminalistics laboratory normally will first determine if the hair sample is of animal or human origin. If animal, a general determination can be made as to the species (cat, dog, cow, etc.). Information that may be revealed as a result of laboratory examination of human hair includes:

- The race of the individual, subject to biological overlap and variation.
- The part of the body from which originated (within certain limits).
- Whether the hair was forcibly removed.
- Whether the hair had been cut with a dull or sharp instrument.
- If the hair had been treated as, for example, with chemical dye or bleach.
- Whether the hair had been crushed or burned.

Possible Conclusions Concerning Hair Sample Analyses

The laboratory normally will conclude with respect to hair comparisons one of three things:

- That the hairs match in terms of microscopic characteristics and that they originated from either the same individual or another individual whose hair exhibits the same microscopic characteristics. (Note the qualification that is necessary with respect to precise identity.)

PARTS OF THE HUMAN HAIR

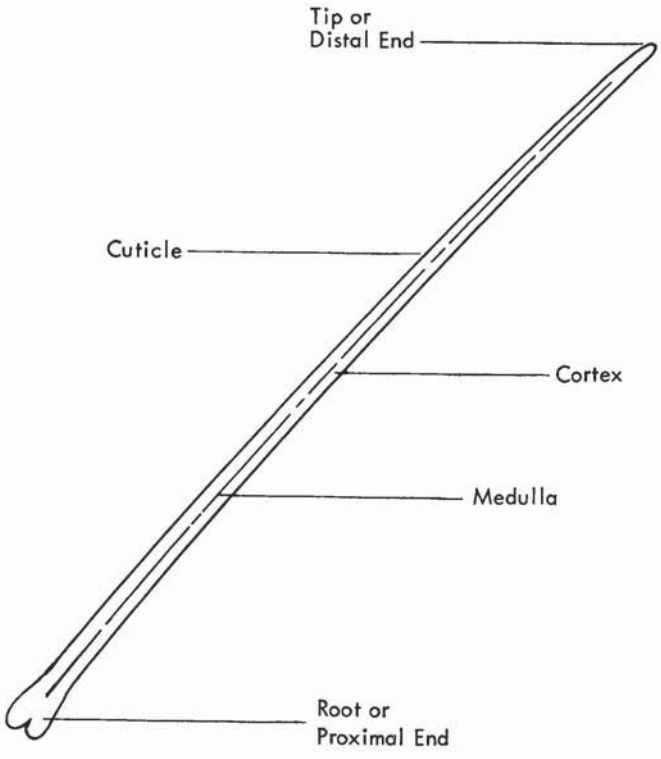


FIGURE 13

- That the hairs are not similar and did not originate from the same individuals.
- That no conclusion can be reached.

The laboratory cannot make a conclusive determination of the sex or the age of the individual from whom the hair originated.

Crime Scene Procedures With Respect to Collecting Hair Samples

Hairs discovered at the crime scene should be carefully removed with a pair of tweezers. The hair sample should be placed in a clean container, such as a pill box, or it may be folded into a piece of clean paper. If paper is used, care should be taken to avoid kinking the hair by folding. If a pill box is used as the container, the investigator should be sure that the entire length of the hair is in the box and is not crushed between the top and the bottom when the lid is put on.

The procedures for recording, sealing, marking, and keeping separate the hair samples are the same as for other types of evidence discussed in this handbook.

Collection of hair standards from both the victim and the suspect is important because most examinations of hair are comparative. When collecting hair standards from a deceased victim, the investigator should obtain samples from the head (crown, temple, nape, beard, eyebrow), arm, underarm, chest, pubic, and leg areas. About 40 hairs should be included from each area. The samples from each area should be packaged separately. Hair surrounding any wounds on the body of the victim should be removed and placed in a container that is marked with specific information concerning the wound area, as well as other usual identifying data. The hair surrounding a wound should be very carefully removed so that neither the hair nor the wound are further damaged. Hairs crushed by careless handling with tweezers are difficult to distinguish from those that have been damaged by a bullet or a blunt instrument.

When collecting hair standards from a live victim or suspect, the head and pubic areas should be first combed before other hair samples are collected. Pulling is the method recommended for collecting hair samples from all persons, living or dead. However, if the samples are cut, the cut should be made as close to the skin as possible. Approximately 20 hairs should be included in each sample.

Standards should also be obtained when pets or fur are involved in the investigation.

Contamination of hair standards and samples can easily be introduced if the investigator fails to use a new comb or to clean the tweezers or scissors after each area is sampled.

Fibers

Fibers generally are classified as being mineral (glass, asbestos), animal (wool, silk, fur of all types), vegetable (cotton, linen, hemp, jute), or synthetic (rayon, nylon, dacron). There are additional classifications pertaining to the type of the processing and the composition of the fibers into other materials, such as yarn, thread, cloth, and other items.

Envelopes alone should never be used for packaging fibers, sweepings, or other very small materials. The corners of envelopes are not sealed because they are not intended to be airtight.

If sweepings and small materials are placed in envelopes, the material must first be wrapped in a clean piece of paper which is folded in such a way as to prevent the materials from leaking out. The materials thus wrapped may be sealed in an envelope and the necessary data placed on the outside.

The Examination of the Crime Scene for Fibers

The point was made earlier that fiber samples are usually obtained through vacuum sweepings with a special filter attachment. When each area of the scene is swept, the material in the filter, including the filter paper itself, is removed and placed in an evidence bag. The filter paper in the vacuum sweeper should be changed each time a new sample is taken. The special attachment should be wiped with a clean paper towel before a new filter paper is inserted. If a vacuum sweeper is not available, a whisk broom may be used.

For a fiber examination to have maximum value in associating the suspect with the victim or the crime scene, standards of all materials which may have been contacted by the suspect at the scene of the crime should be collected. Thus, in a residential crime setting, standards should be taken from rugs, drapes, furniture, and any other similar material which may have transferred fibers to the clothing of the suspect. (The earlier discussions concerning the search of the suspect's clothing would apply in this context.) If, for some reason, the clothing of the suspect or the victim is not submitted to the laboratory, adequate standards should be taken from each garment after the sweeping operation is completed. When clothing is sent to the laboratory, the standards will be collected by the technician examining the garment.

At the laboratory, fibers will be identified as to type, color, and matching characteristics based on microscopic, microchemical, and melting point examinations. In most cases, fiber matches are not positive evidence and require substantiation with other corroborative evidence.

Tape examination, similar to cloth fragment examination, generally involves the matching of the ends of pieces of tape used at the scene of the crime with the end of tape on the roll found in the possession of the suspect.

String, Rope, and Containers

String

String is commonly found in homes and offices, and is a type of physical evidence frequently overlooked in a crime scene search. Like clothing, string may have considerable microscopic material adhering to it which will aid in identifying its environment and any contact it may have had with suspects or locales involved with a crime.

When collecting string or rope, the investigator should not untie or cut through any knots. The material should be packed in a suitable clean container; sealed and marked with the necessary information.

String can be identified by its fibers and by the method of its manufacture. The following synopsis of a case processed by the Kansas City Police Department illustrates the potential evidence value of string samples.

The case involved three instances of arson. At each of the fire scenes the remains of a cotton wick used to delay the ignition of gasoline was recovered in the debris remaining in some plastic-lined cardboard boxes. The string from each of the wicks was examined and found to be of the category 23 strand white cotton. A check with manufactuers of this type string revealed that it was never intentionally manufactured with 23 strands but only 20 or 24 strands. Thus, this particular sample had the added value caused by its rarity. The string alone gave strong indication that the three wicks were made from the same spool of string and indicated that the fires were set by the same person. This information, together with other evidence yielded by trace materials found on the scene, led to a successful clearance of the case.

Ropes

Ropes are manufactured by either twisting or braiding strings together and using different types of fibers. The value of rope as evidence depends upon its unusual (rare) qualities, the trace materials that may adhere to it, and the physical characteristics of the ends of the rope.

Containers

All types of containers left by the suspect at or near the scene of the crime should be given special attention by the investigator. In the arson case just cited, an envelope bearing the address of the suspect was found beneath the plastic lining of one of the cardboard boxes left on the scene.

The form and construction of containers, together with marks on their surfaces, can also yield valuable information. If the container is cardboard or some other surface able to sustain a latent print, it may lead to identification of the suspect. Because a container has the potential of yielding several types of evidence, its wrapping and handling

should be done with the same care shown any other evidence item. While it is important that prints on the outside of the container should not be damaged, it is equally important that any contents of the container not be allowed to spill or leak.

The examination of a container for trace materials must, of course, precede any effort to collect fingerprints.

SOILS, ROCKS, MINERALS AND DEBRIS

General

Particles of soil, rocks, and other minerals may be found on the suspect's shoes, his clothing, and his personal items. Such particles may also be found in vehicles, on tools used in the crime, and on the victim. Dust is composed of particles of soil and other debris light enough to be moved by air currents. The common dusts associated with sweepings of the garments of the suspect and the victim are of little value as evidence because they are composed of such widely varying materials. Soil, for purposes of this discussion, is considered to be the top surface of the earth down to a level that the normal foot or tire impression would extend.

Debris is the remains of any larger object that has been broken down. Thus, scraps of building materials, safe insulation, shards of glass and pottery, all exemplify debris.

The Value of Soils and Rocks as Evidence

There are both natural occurring and man-made soil and rock variations that give a distinctive character to many areas. One of the primary uses of soils and rocks as evidence is to compare the crime scene with samples on the suspect's clothing or other possessions.

Soil and rock evidence is most likely to be obtained when the crime was committed out of doors, or when the suspect was required to drive or to walk on unpaved areas. There are numerous ways in which soil and rock evidence can be transferred:

- The offender may deposit at the crime scene rocks or dried soil particles he picked up at some spot outside the area of the scene.
- Similarly, the offender may pick up soils or rock particles from the crime scene and retain them in cracks of the heel of his shoe or in his pant cuff.

A vehicle involved in the commission of a crime may dislodge soil from its undercarriage at the scene of the crime. The victim of a hit-and-run accident may have on his clothing soil or mineral particles that were transferred by the vehicle that struck him.

Whenever foot or tire impressions are noted at the scene of the crime, there is a concomitant possibility of soil or rock evidence being recovered from the person of the suspect or his vehicle.

The Evidence Value of Debris

It is very difficult to discuss the subject of debris specifically for the reason that such materials encompass so wide a variety of things. However, there are two categories of debris that warrant special consideration: plaster and building materials and safe insulation.

In breaking into a building it is common that a variety of building material debris will be created. Cinder block and brick fragments, pieces of plasterboard, splinters of wood, glass shards, plaster dust, and perhaps the fragments of the tools utilized to make the entry are all distinct possibilities. Because of the strenuous nature of breaking and entering, there is a high probability that some of the debris will be on the person of the offender. Debris that has become mixed in the soil has particular value as evidence. For example, a burglar breaking a window pane to force entry to a dwelling may cause small particles of glass to become intermixed with the soil around the point at which he was standing. A sample of this soil-debris mixture would be a valuable comparison sample that could be matched with material on the suspect's shoes. Debris samples should, therefore, always be collected at the crime scene.

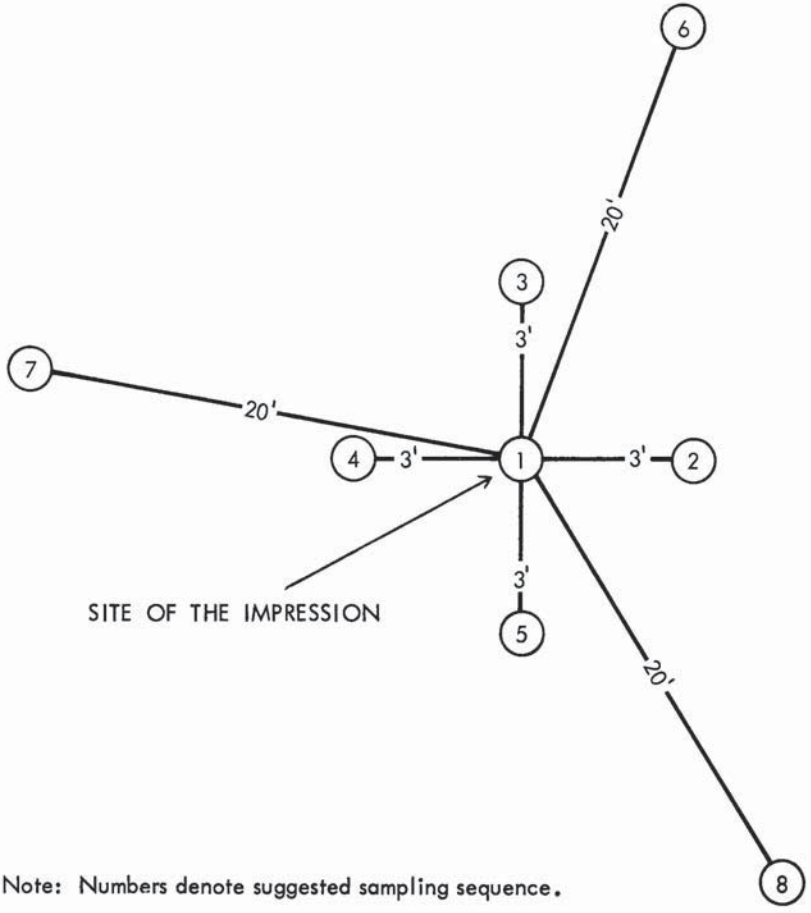
Safe insulation is commonly scattered about the immediate area when the wall of a safe has been penetrated. Some of this insulation may be picked up on the perpetrator's clothing. The investigator may also find, after close examination of the scene, that the dust and debris on the floor will carry some impressions of the offender's footprints. The exact composition of a safe insulation is usually a trade secret; however, the criminalistics laboratory has data on the types used by major manufacturers and can make some comparison and studies of insulation specimens.

General Collection Procedures

Personal articles, including clothes and shoes suspected of containing soil, rock, or debris with evidence value, should be placed in clean bags and sent intact to the crime laboratory.

Samples of soils should be collected from footprints or tire prints that are suspected to have connection with the crime (but only after photographs and casts have been made of the impressions). After the sample has been collected from the impression, additional samples should be systematically collected from the area around the first sample (Figure 14). The area chosen for these samples should be measured from the point of the first sample and the measurements recorded in the investigator's notes. It is usually a good procedure to collect samples at the four points of the compass, about

METHOD OF COLLECTING SOIL SAMPLES FROM FOOT AND TIRE IMPRESSIONS AND FROM THE SURROUNDING AREA



Note: Numbers denote suggested sampling sequence.

FIGURE 14

3 feet from the first point of sampling. Several additional samples should then be obtained at a distance of 20 feet or more from the first. If a spoon or other implement is used, it should be carefully cleaned after each sample is taken. Generally, paper envelopes are poor containers for soil samples because they tend to allow the material to spill out. Soil samples are best placed in pill boxes, which are then sealed.

Soil, mineral, and rock samples should never be mixed. Even if they are discovered very close together, they should be kept separate after collection.

Special Notations Concerning Samples

When soil, rock, and debris samples have been taken over a fairly extensive area, it is good procedure to prepare a separate, detailed sketch showing the location of the points sampled and a description of each.

The collection of a general dust sample may not be necessary if there is other evidence to implicate the offender. However, as a general rule, it is recommended that dust samples be taken before the crime scene is released.

CHAPTER IX

FIREARMS

INTRODUCTION

The use of firearms in the commission of a crime has been increasing for several years. The police investigator will be frequently confronted with the recovery of firearms, live ammunition, spent cartridge cases, and spent bullets. The value of these items as evidence will depend, to a significant degree, on the proper recovery and subsequent handling by the investigator. The legal and scientific requirements concerning this type of evidence must be observed with particular care.

TERMS USED

Some misunderstandings have occurred because of misuse of certain terms in reference to firearms. One example of such a misunderstanding is the use of the word "pistol" to mean all types of handguns. Firearms examiners take pistol to mean all handguns that do not have a revolving cylinder. Handguns with revolving cylinders are called revolvers. It may be properly said that handguns are divided into two groups: pistols (automatic and semiautomatic) and revolvers (swing out cylinders, break top, side load, or solid frame).

When a live round is fired it produces two components: a spent cartridge case and a bullet. A bullet is thus only a component of a live round.

Shotguns are referred to as smooth bore weapons by the firearms examiner.

HANDLING FIREARMS AND AMMUNITION DISCOVERED IN THE SEARCH

This discussion assumes that all the preliminary acts and precautions associated with general evidence collection have been accomplished. We are concerned here only with aspects of the search that apply uniquely to the collection of firearms evidence.

Before picking up a firearm, the investigator should note the position of the hammer, if the weapon has one, and record that the hammer is down, half cocked, or cocked. The position of the safety on the handgun should also be noted, if possible. It may

be necessary to pick up the weapon in order to determine this. The position and number of cartridge cases in the vicinity should also be noted.

The investigator should add to his notes not only the exact location of the weapon and all related materials, but also the make, model, serial number, caliber, and other descriptive information concerning it. He should also note how and where the firearm was marked.

Firearms should be picked up with care to preserve any fingerprints or other trace materials which may be present and, of course, to prevent accidental discharge. A handgun should be picked up by the edge of the trigger guard or the checkered portion of the grips, which will usually not retain identifiable fingerprints.

Any rough surfaces on the gun, such as the serrations on the slide of a semiautomatic pistol or the cylinder release button on a revolver, may be used to pick up the weapon and to help hold it securely while unloading. Rifles and smooth bore weapons should be handled by the trigger guard edge and the serrated parts of the stock and forepiece.

All firearms should be unloaded at this point. When unloading a revolver, the investigator should note the fired or unfired condition of the ammunition under the firing pin. This information, together with the position of the other fired or unfired ammunition, should be entered in his notes. In unloading a semiautomatic pistol, the number of rounds left in the magazine and whether or not a round is in the chamber should be recorded.

This type of information usually is very important. The determination that the case is a homicide or a suicide may rest on the position of the hammer or the safety, on the number of fired rounds, and the position of the fired rounds in the weapon. At times, this information has been lost due to careless recovery, note taking, and handling by the investigator.

Processing Damaged or Rusty Weapons

Occasionally an investigator recovers a gun that is loaded or presumed loaded and cannot be checked or unloaded. Examples would be a weapon that has been exposed to the elements and badly rusted, or is bent or damaged.

In such circumstances, the weapon should be taken to the crime laboratory without any further attempt to process it. If the weapon is not kept under hand, it should be placed in an evidence bag which is marked with large red letters, "CAUTION LOADED FIREARM."

If a gun is recovered which has been wet to the extent that water or other liquid has gotten inside the action or internal parts, it should be taken to the laboratory as soon as possible so that it may be examined and taken apart, if necessary, to dry out. If wet guns are not cleaned thoroughly before they start to rust, it sometimes takes considerable time to clean them up enough to be examined and fired. In addition, the rust may

damage or destroy some of the microscopic details on the breech face, firing pin, chamber, extractor, and barrel. No attempt should be made in the field to clean or dry a firearm taken in evidence.

LIFTING LATENT PRINTS FROM FIREARMS

After the firearm has been unloaded it should be dusted for fingerprints. Any fingerprints developed should be lifted and recorded in the field. It is a good idea to also use the fingerprint equipment to lift the serial number of the weapon when it is processed for prints. This is accomplished by rubbing the finger over the number and then dusting it with powder. Fingerprint tape is then used to lift the number which will appear white against the powdered background. The lifted number can be placed on a fingerprint card with the prints or attached to the officer's notes. When the number is thus copied directly from the weapon there is no possibility of error.

Blood or other substances adhering to the gun should be left intact for examination in the laboratory. An evidence firearm should never be cleaned. However, if trace materials are obviously present on a weapon, the investigator must judge whether to dust for prints in the field and possibly lose some of the trace materials, or to send it to the laboratory without processing the prints. In making this decision, it should be noted that dusting a weapon for fingerprints will normally not harm dry blood traces; and other trace materials may not be on the parts that will hold usable fingerprints.

MARKING FIREARMS

Firearms should be marked for identification by the investigator in an inconspicuous place. In addition, the weapon is tagged to show other pertinent data. A weapon should never be defaced by marking all over the outside of it. A solid frame revolver which does not have a swing-out cylinder or is not of the break-top type may be marked inside the trigger guard on the bottom of the frame (Figure 15). Revolvers with swing-out cylinders may be marked on the inside frame or on the frame opposite the crane (Figure 16). Top-break revolvers are marked on the frame (Figure 17, top). A semiautomatic pistol can be marked in the magazine well after the magazine has been removed Figure 17, bottom).

Rifles and shotguns are also inconspicuously marked. Solid frame weapons can be marked under the forearm guard, in pump weapons, or inside the receiver after the bolt has been opened. Break open rifles and shotguns, i.e., single shot type, can be marked on the frame after the gun has been opened (Figure 18).

IDENTIFICATION MARKS ON SOLID FRAME REVOLVER

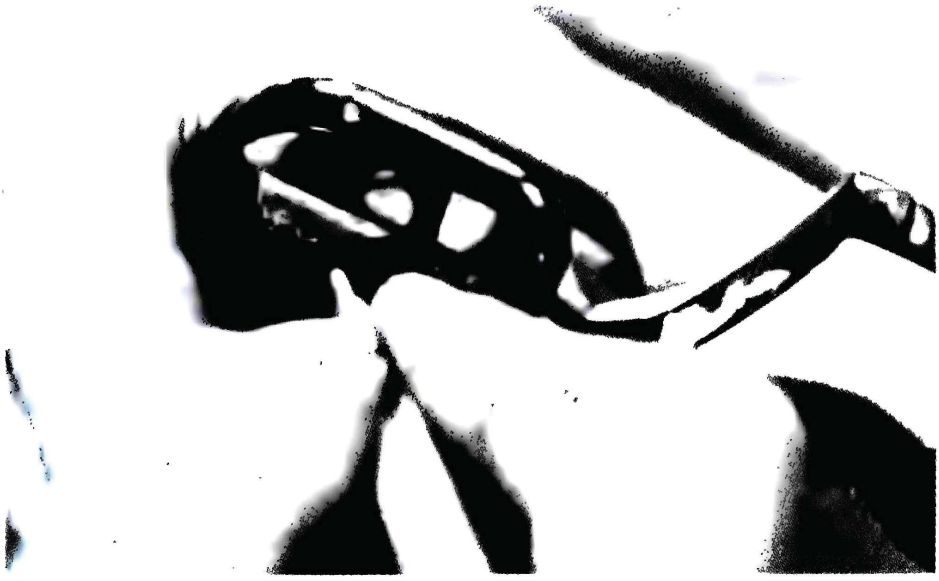


Photo: MRI

The investigator uses his own initials as the indentifiers.

FIGURE 15

IDENTIFICATION MARKS ON REVOLVERS WITH
SWING OUT CYLINDERS

Photo: MRI

Marks are made on the inside of the frame.

Photo: MRI

Alternative location for the marks.

FIGURE 16

IDENTIFYING MARKS ON TOP BREAK REVOLVERS AND SEMIAUTOMATIC PISTOLS

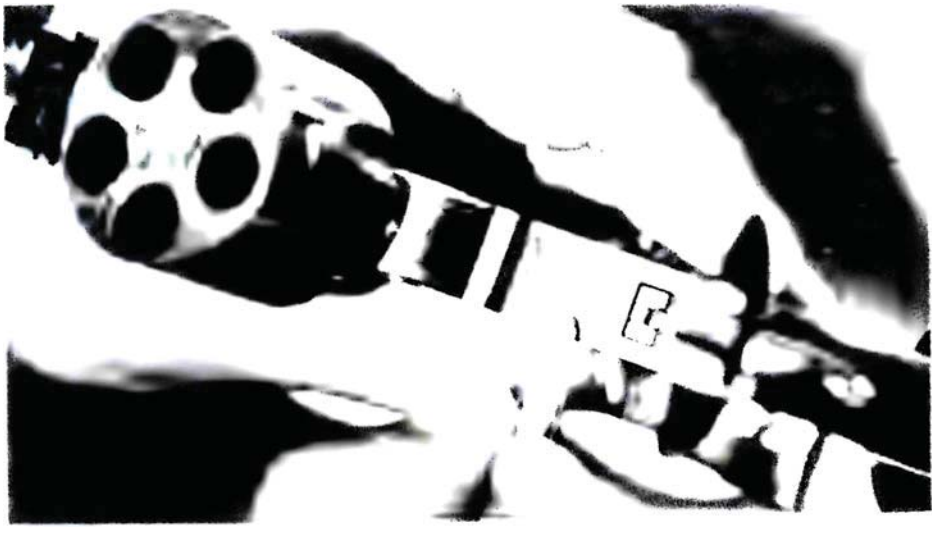


Photo: MRI

Marking top break revolver.

Photo: MRI

Marking semiautomatic pistol.

FIGURE 17

Photo: MRI

The break open type gun is marked on the inside bottom frame. (Similar position used on over and under type rifles.)

Photo: MRI

Mark pump weapons on magazine after slide has been moved to the rear. (Same general position used on similar type rifles.)

FIGURE 18

EXAMINATION OF FIREARMS BY THE LABORATORY

Firearms examinations are concerned with fired cartridge cases, bullets, live rounds of ammunition, and firearms residue, as well as with the firearm itself.

Thus, all of these items or materials should be recovered, if possible. A fired bullet can usually be identified with a particular type of firearm by examining the land and groove impressions left on it by the rifling of the barrel provided, of course, that the bullet is not too mutilated (Figure 19).

Each manufacturer has his own specifications as to the number and width of lands and grooves, and the direction or inclination of their twist. With this information, the laboratory examiner can often determine the type caliber and make of the firearm used to fire the bullet.

While the bullet is marked by the barrel only, the fired cartridge case is marked by several parts of the weapon in the actions of loading, firing, and extracting. When the firing pin strikes the primer, its impression is recorded. This is true in both center fire and rim fire ammunition. When the burning gases inside the casing begin to expand, the casing is forced out against the walls of the chamber and back against the breech facing of the weapon. Any striations present on the breech face and any damage in the chamber will thus be recorded on the casing. Ejector and extractor markings are left on the rim of the casing, even if the cartridge was merely run through the action and not fired. The cartridge case may be marked by the lips of the magazine in the case of semiautomatic pistols. Other markings may appear on the shell casing due to the particular type of action of the firearm.

Examination of the cartridge case will also reveal if it was fired in a weapon other than the type and caliber it was manufactured for. Live rounds manufactured for use in a revolver that are fired in a semiautomatic weapon are readily identified by the firearms examiner.

Because the barrel is the only surface that marks the bullet when it is fired, the investigator should use great care not to damage the barrel in any way. (The old movie cliché of picking up a handgun by placing a pencil or ballpoint pen in the barrel is out. Never let anything enter the barrel of an evidence weapon).

MARKING BULLETS AND CARTRIDGE CASES

When bullets are discovered at the scene, they are marked on either the nose or the base (Figure 20). No marks should be placed on the surfaces marked by the barrel. After the bullet is properly marked it is rolled in a piece of tissue or paper and placed in a rectangular pill box. Bullets are never placed in a container where they can roll around. They are never carried in the pocket where they can be damaged.

PHYSICAL MATCH OF BULLETS

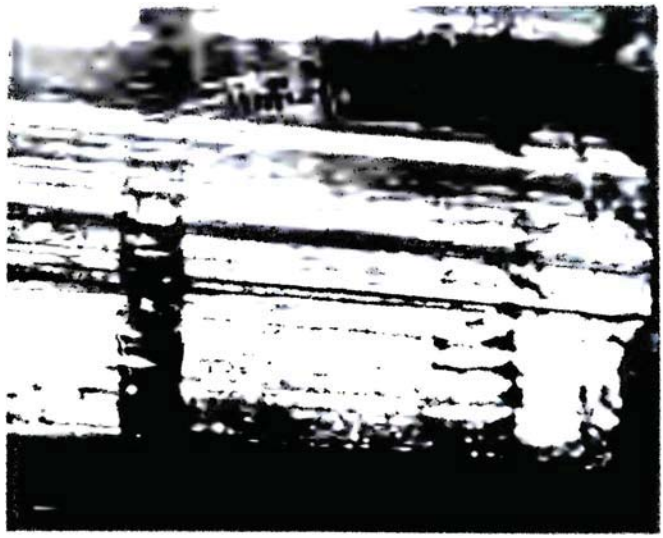


Photo: KCPD

Photomicrograph taken through the comparison microscope, showing two bullets (left and right of center) that were fired through the same revolver.

FIGURE 19

MARKING BULLETS FOR IDENTIFICATION

Photo: KCPD

Proper method of marking a bullet for identification purposes. Mark only on the nose or the base.

FIGURE 20

All evidence must be marked by the person recovering it. When a bullet is removed from a body by a surgeon, it should be marked by him as well as by the officer who receives the bullet from him. The surgeon should be cautioned not to further mutilate the bullet in recovering it. This will be a problem only when the bullet is being removed from a live victim. In this case, the doctor will do the best he can, considering first the welfare of the patient.

If bullets are wet with water or body fluids when they are recovered they should be allowed to air dry only before they are packaged. If a bullet is wiped, important trace materials may be removed and marks may be damaged. If liquids are not allowed to dry, they may begin a chemical action which is also very undesirable.

Cartridge cases should be marked inside the mouth of the case, if possible (Figure 21). If the casing is too small to allow this or is crushed flat, it may be marked on the outside as near the mouth of the casing as possible. When marking any form of evidence, the investigator should not use an "X". The investigator should use either his initials or some other distinctive mark. A crushed casing should not be opened and should not be marked on the outside close to the rim, because it is there that most markings from the gun's action are found.

The exact location from which a shell casing was recovered is important information. Casings are most likely to be encountered on a crime scene when a semiautomatic weapon was fired. The ejection pattern of the casings can help establish the relationship of the position of the suspect to his victim. Casings should be marked, wrapped separately in paper, and placed in a (prefereably rectangular) pill box. The box should be sealed. The identifying information concerning the case and the evidence is then placed on the outside of the container.

BULLET FILES MAINTAINED BY THE CRIMINALISTICS LABORATORY

A file is maintained in the laboratory for all unsolved crimes where bullets and cartridge cases have been recovered. Bullets are filed according to caliber, number of land and groove impressions (riflings), and the direction of their twist or inclination.

Whenever a firearm is recovered and submitted to the laboratory, it is fired, if in firing condition, so that standards can be compared with questioned bullets and the unsolved crime file. If the gun is not in firing condition, it is often repaired so that test firings may be made. For this reason, all firearms recovered should be sent to the laboratory for examination. Frequently, criminals use the same gun in committing several crimes, and the laboratory may be able to prove that the gun was used in a crime in another area that the investigator was unaware of.

MARKING CARTRIDGE CASES FOR IDENTIFICATION

Photo: MRI

Mark inside the mouth if possible, if not, mark on the side. Use care not to mark too near the rim and never on the base.

FIGURE 21

LIVE AMMUNITION AS STANDARDS

During the crime scene search or the search of a suspect and his environment, the investigator should be alert for live ammunition, particularly if it is important to know the distance the firearm was from the victim when it was discharged. The use of the same ammunition in the same gun is important in making this determination.

To determine the distance the weapon was from its target when discharged, the lab first examines the area struck by the questioned bullet. This area may have only a hole in it and no other residue. The examiner then uses the same ammunition and the same gun involved in the case and fires it at measured distances. It may then be noted that at a certain distance, say 3 feet, no residue is deposited on the test material. In this case the laboratory examiner will have to conclude that the weapon was held 3 or more feet from the victim when it was discharged.

If the questioned area (struck by the original bullet) has unburnt powder traces, partly burned powder, or smoke or burning, the laboratory will be able to estimate the distance the gun was held from the bullet's point of impact fairly accurately. The limit on determining the distance that the firearm was held is the maximum distance that the unburned powder will travel from the muzzle of the gun. Similar estimations of the distance that a smooth bore weapon was held from its target can be made by examining the spread of the shot at measured distances.

SERIAL NUMBER RESTORATIONS

Many items manufactured today can be identified by a serial number. Perhaps on no other item is a serial number of such evidentiary value as on a firearm, although the value of a serial number is certainly not restricted to firearms. This section outlines the crime laboratory's capability in restoring serial numbers generally, and particularly those on weapons.

The serial number is usually stamped on the body or frame of an item or a serial plate is affixed. Some serial plates are metal and are either welded or riveted on. Others are thin pieces of plastic or film glued to the object.

The serial numbers of firearms, office machines, television sets, radios, and motor vehicles are often removed or obliterated by the criminal to prevent their identification. If the serial plate has been removed, there is little that the laboratory can do in identifying the item unless it has a "secret" number in some other place. (Motor vehicles are examples of items with "secret" serial numbers.) If the film type serial plate has only been painted over so that the numbers cannot be read, the laboratory will usually be able to remove the paint by the use of solvents.

Serial numbers that have been stamped into a metallic object are frequently removed by grinding or punching the surface so they can no longer be read. Even numbers obliterated in this manner can be restored by the laboratory, provided that the surface has not been ground off too much or punched too deeply.

The restoration of a serial number can be done only in the laboratory. There are no field expedient methods. Basically, the procedure involves polishing the area where the number was inscribed, and then swabbing it with an etching solution until the number appears. As soon as the number appears it is photographed, because it may disappear again. When items with obliterated serial numbers are encountered by the investigator, they should be transported to the laboratory for examination. All such items are recorded, marked, protected, and transported in the same manner as other forms of physical evidence.

Figure 22 is a photograph of a number restored on the frame of a .45 automatic. The serial number, No. 433989, is readily seen.

Powder Residue Tests

There are numerous methods of testing for firearms residues. More recently, sophisticated techniques such as neutron activation analysis and atomic absorption have commenced to be used, along with the more conventional techniques. While there is some agreement by some criminalists on superior validity of one test versus others, there is no general agreement in the forensic sciences or law enforcement communities as to the preferred method. This general air of uncertainty of the powder residue tests has led some crime laboratories to abandon use of such tests altogether.

Scrupulous attention should be paid by police investigators to the method of collecting firearms discharge residues that are specified by the laboratory supporting them in this regard. Because of the disparity of tests employed, specific procedural steps concerning each cannot be included here.

EXAMPLE OF RESTORED SERIAL NUMBER ON A WEAPON

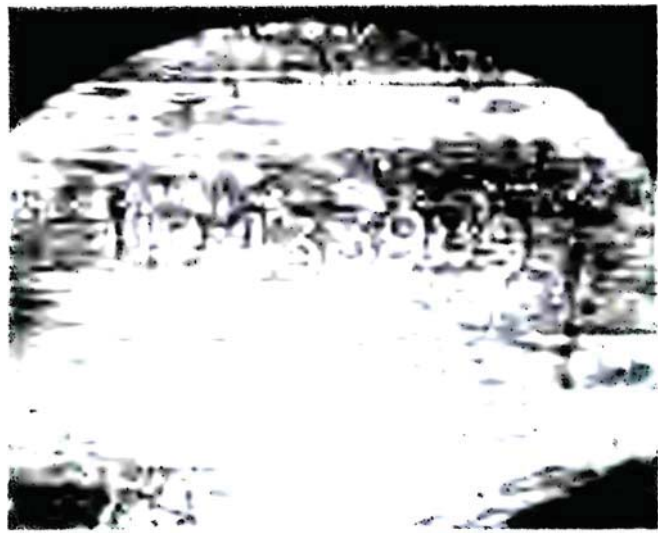


Photo: KCPD

This serial number restoration on the frame of a pistol was done by the Kansas City Police Department Crime Laboratory Unit.

FIGURE 22

CHAPTER X

TOOL MARKS AND BROKEN METALS

INTRODUCTION

Crimes against property frequently involve forcible entry on the part of the criminal, or the application of some form of force against objects or areas that are the specific targets of theft. Perhaps one of the most common long-standing criminal stereotypes in the American public consciousness is the burglar with a sack of tools. While it is true that a large number of burglaries are being committed by what may be loosely termed amateurs, hitting unlocked homes and buildings, there are a high number of crimes against property that produce a large amount of evidence of the type covered in this chapter. Because property crimes are among the hardest to solve, this type of evidence assumes special importance. For convenience, the term "tool mark evidence" is used at some points in this narrative. It is intended to cover tool marks, the tools that made them, and the trace materials that may be associated with either the mark or the tool.

We treat the subject of broken metals separately in this chapter, although much of what has been defined as tool mark evidence involves broken metal objects as well. However, broken metals cover a considerably broader scope than tool marks and tools, and thus should be considered apart.

TOOL MARKS

Definition

For the purposes of this discussion, a tool will be considered as any object capable of making an impression on another solid object. A tool mark is considered to be any impression, cut, gouge, or abrasion that results when a tool is brought into contact with an object.

A tool mark may be pressed into the material, in which case it is classified as a negative impression. Figure 23 shows an example of this type of impression.

A tool will frequently impress its own outline into the material, and also cut channels or furrows that run in parallel lines. These furrows are known as stria. Thus, material

EXAMPLE OF A NEGATIVE (IMPRESSED) TOOL MARK

Photo: MRI

Negative impression on a door imparted by levering action of a screwdriver. Note that the outline of the mark and its uniform depth clearly suggest the type of tool used.

FIGURE 23

marked in this way is referred to as striated. Even very minute protrusions or indentations on the blade of a bolt cutter or knife can create this combination of distinctive marks. A combination mark is thus defined as one made by tools that create both an abrasion or friction on the surface and a negative impression as a result of some levering action. Figure 24 illustrates this type.

The Evidence Value of Tool Marks

A tool mark in metal or other hard substances will frequently yield microscopic characteristics which are particularly valuable in achieving positive identification of the tool that made the impression.

Class and Individual Characteristics of Tools

Tool marks and the area immediately surrounding the mark, can reveal the class characteristics of the tool that was used.

The class characteristics of a tool are usually considered to be those that distinguish it functionally from another. Thus, screwdrivers may be considered as a class apart from wood chisels because they have different intended functions. The class of a tool can also be defined in other ways--for example, according to the shape of the operating head or shaft of the tool. The essential point is that class characteristics of tools (or any other item) serve, in the criminal investigation, as a screening device to narrow the field of search.

However, tools similar in class characteristics will be quite different in their individual characteristics. These individual characteristics result from the processes used in their manufacture and the way the tool has been used. The small burrs that develop on the bit of a screwdriver, and the nicks in the blades of metal shears are individual characteristics of that particular tool--and, if the material receiving the tool mark is hard enough to retain the resulting minute impressions or striations, these characteristics will be permanently imparted to the mark, and can be microscopically examined in the laboratory.

While the investigator making the crime scene search can frequently determine the class of a tool used by careful examination of a mark, positive identification of a particular tool can only be done by the laboratory tool mark examiner, working with the special lighting and microscopic instrumentation that is available to him in the laboratory. Thus, on-the-scene identification of tools should not be expected.

COMBINATION TOOL MARK IN METAL

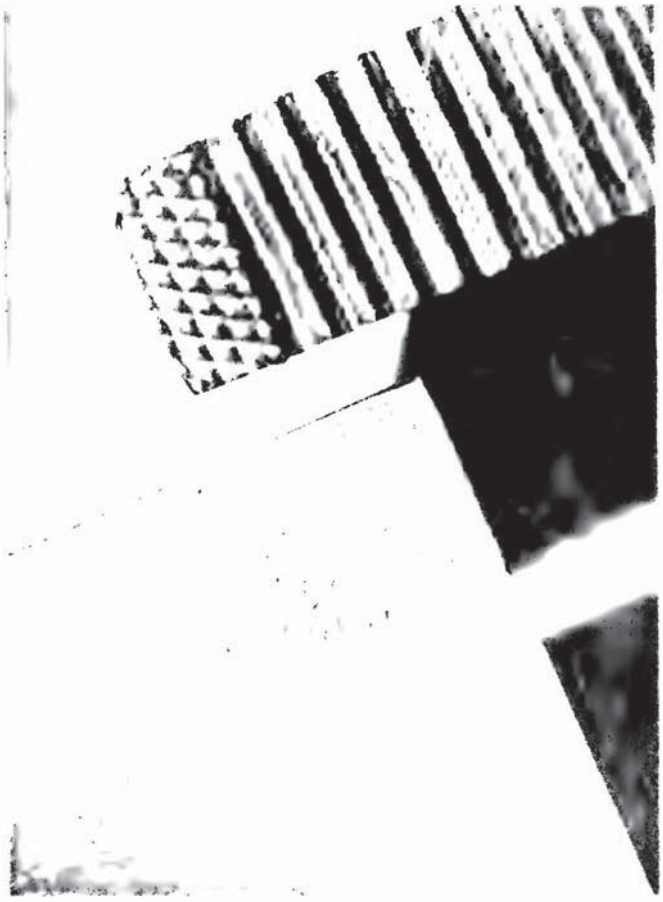


Photo: MRI

A combination tool mark in metal. Note indentations made by protrusions on the tool and the small friction marks on the surface.

FIGURE 24

Information and Leads That Can Be Derived From Tool Marks

The impression left by a screwdriver used to pry open a window may reveal not only the width and outline of the head of the tool, but also the shape of the shaft, and how the shaft joins the head. Frequently, tools used by a criminal are of poor quality and are thus easily damaged. The damage done to a tool will be reflected in the marks it leaves, if the receiving material is hard enough. Such evidence of damage becomes an important element of the "signature" of the tool, and contributes significantly to the sum total of the individual characteristics that are used to identify one tool to the exclusion of all others.

Important information concerning the tool may be acquired from trace materials left in the impression, on the surface around it, or on an object. For example, paint from a tool used to gain forcible entry can be transferred to the impression as can lubricants. Similarly, paint and other surface materials can be transferred to the tool.

Special Considerations in Collecting Tool Mark Evidence

Marks

Tool marks are most likely to be discovered at the point of entry to or exit from the crime scene, along the route taken by the criminal, or on an object that has been forced during the commission of the crime. Doors, windows, transoms and other appertures in buildings are thus of critical interest in the search, as are any containers that were forced open.

Distinctive marks may also appear on metal pieces or fragments of an object, such as an exploded bomb, that were introduced to or damaged at the scene of the crime. (See also the following section "Broken Metals.")

As tool marks are discovered they should be completely recorded before being removed or before casts are made, if the latter action is appropriate.

When tool marks are discovered on items that can be conveniently removed to the crime laboratory, such removal is desirable. Original evidence is more useful for scientific examination and evaluation than is a reproduction, such as a cast or photograph. If the mark appears on items too large to be sent to the crime laboratory, it may still be possible to remove the area that contains it. If removal of an object bearing a tool mark is undertaken, a sufficiently large piece of the surrounding surface area should be removed to prevent damage to the mark through bending, splintering or breaking. If the surface bearing the tool mark is painted, standards of the painted surface in the immediate vicinity of the removed surface area should also be sent to the laboratory.

Removal of part of a surface may involve little effort and result in no permanent damage. On the other hand, it may be necessary to inflict considerable damage, or even to

destroy an item in order to retrieve a tool mark. For this reason, before any destructive cutting or removal is done, the investigator should carefully evaluate the evidence value of the mark. If only the class characteristics of the tool can be determined from it, as is usually the case with tool marks in wood, a close-up photograph, which includes a scale, and a silicone cast will usually suffice. Tool marks in metal usually reveal the individual characteristics of the tool and are, of course, generally higher in evidence value. The question then remains whether destructive removal of such a mark is justified. Such decisions are a function of the investigator's judgment.

Tools

Once a tool mark is found, the tool that was used to make it becomes a critical object of search. (However, if the tool is not found, the marks should still be preserved, removed or a cast made from them, as circumstances dictate.)

Similarly, if the nature of the offense suggests the possible use of tools, a search should be made for these items on the suspect's person, or in his vehicle and residence, as applicable. The area around the point of the suspect's apprehension or arrest should also be searched for tools. At the approach of police, suspects frequently throw away items used in the commission of a crime; and tools used in the commission of a crime are usually perceived by the offenders as highly damaging evidence.

Each tool should be carefully examined for trace materials which may lead to identification of the owner. Tools are only valuable as evidence if it can be shown who owns them and last used them. The tools are then processed for prints. This completed, they are properly marked, wrapped separately, and forwarded to the laboratory.

A Warning Concerning Collection of Tools and Tool Marks

Never attempt to "fit" a tool found on the scene into an impression. There are two important reasons for this unvarying rule. The first is that the tool may impart additional marks to the impression, thus permanently destroying its evidence value, even if the tool was, in fact, the one used. The second reason concerns trace materials that may be adhering to the tool or the impression. Such materials could easily be lost or contaminated by attempts to determine whether a tool fits an impression.

Marking, Packaging and Preservation of Tool Mark Evidence

A small item to be removed, such as a door knob, striker plate, or vending machine lock should be marked by the investigator showing the top and front of the item, as it was normally positioned. Such information prevents confusion and greatly aids the laboratory examiner.

Marks should never be placed in or near enough to an impression to in any way mar its outline, nor should identifying marks be made on the operating or cutting head of a tool.

Objects bearing tool marks should always be handled and packed in such a manner as to guard against any contact between a hard object or surface and the mark itself. Handled carelessly, it is entirely possible for a tool mark to pick up additional striations or impressions. In that event, the evidence value of the mark is, of course, destroyed. Protect the mark by wrapping or covering it with paper or some other soft, dry material, and pack the object to avoid friction or pressure over the marked area. As with all other types and forms of evidence, the containers or packages should be sealed and marked with all appropriate information.

Tool marks and tools may yield valuable trace evidence, a fact that investigators should always bear in mind when examining or collecting marks and the tools suspected of having made them. Chips of paint adhering to a tool or an impression are perhaps the best example of the transfers of trace materials that can occur as a result of using a tool to gain forcible entry to a building. Obviously, the presence of such material greatly enhances the value of either a tool or a tool mark as evidence, and calls for special protective means in the collection and packaging of the items.

When tools are recovered, the investigator should mark each one, taking care not to lose any trace materials such as paint and grease. Never clean a tool. Send it, as found, to the laboratory.

Each tool is wrapped in a piece of paper and sealed. After the tool is completely wrapped, an additional protective covering should be placed on the outside of the package to cover the cutting or "marking" end of the tool. This is to protect the tool in case it is accidentally dropped. The necessary identifying information is then placed on the outside of the container. Never place tape or other sticky material in direct contact with the tool. When the tape is removed it will also remove any trace materials that may be present.

Recording Tools and Tool Marks

The general procedures for recording physical evidence presented in Chapter V apply to tools and tool marks as well. However, it is particularly important that the investigator's notes and sketches accurately reflect the position of all tool marks and tools discovered. Particularly, the height of a tool mark from the floor or ground and the direction of access to the area of the tool mark should also be recorded.

Photographs should be taken of all tool marks to show the general relationship of the mark with respect to the room or area in which found and close-up detail that illustrates the extent and configuration of the mark. (Note again, however, that detailed comparisons of tool marks cannot be made at the crime scene. They must be done in the laboratory.)

Crime Laboratory Procedures for Processing Tool Mark Evidence

When tools which are to be compared with questioned tool marks arrive at the laboratory, the criminalist first processes each of them for trace materials. He then compares the class characteristics of each tool with the questioned marks to determine which, if any, of them could have been the one used. If the class characteristics of a particular tool apparently conform to those exhibited by a questioned mark, he then prepares a standard tool mark for comparison purposes.

Preparing tool mark standards is the most difficult part of the laboratory examination of tool mark evidence. The tool must be held as near the same horizontal, vertical, and rotational angle as it was held when the questioned mark was made.

When the standard mark has been prepared, the two marks are then placed on the stages of a comparison microscope and examined side by side.

Figure 25 is a photograph of a tool mark comparison as seen through a comparison microscope. Note how almost every striation corresponds with a striation on the other side of the small black line in the center of the photograph.

BROKEN METALS

The investigator may encounter broken metals in the investigation of almost any type crime. While broken tools are the most frequently encountered forms, the investigator should be alert for other types of broken metal items. Pieces of metal or plastic are frequently broken from the headlight ring or other parts of a vehicle in hit-and-run cases. Items which are stolen are frequently broken from their mounts. In such cases, the mounts are important in proving that the object was the one stolen.

There are many other possibilities for broken metals or objects to appear in evidence. For example, an antenna broken from a "walkie talkie" used by a suspect during the commission of a crime was important evidence in a Kansas City burglary case which led to a conviction.

The shape of the break is usually the most important aspect of the broken metal comparison. It is therefore important to protect the edges from further damage when recovering and packaging broken metals. If the broken end of the object, such as a tool, has been used vigorously after it has been broken, an identification may not be possible on the basis of comparisons of the shape of the break. However, comparisons may be made of striations on the outside of the tool or object, and also of the trace materials, such as paint and grease which may be common to both pieces.

TOOL MARK COMPARISON AS SEEN THROUGH A COMPARISON MICROSCOPE

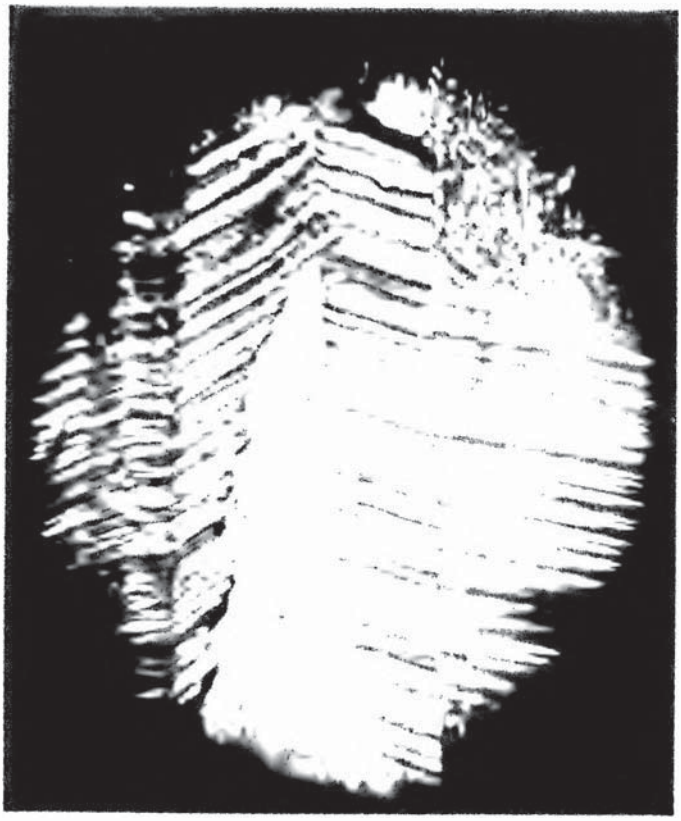


Photo: KCPD

The combination tool mark in the left half of this photograph was made as a result of entry having been forced to a Kansas City warehouse. The mark at right is a standard prepared by the crime laboratory expert, using a brake adjustment tool that was discovered during the search of the scene. From the nearly identical striations in the two marks, it was concluded that the recovered tool was the one used in the commission of the crime.

FIGURE 25

When broken metals are recovered from the scene of the crime (and are also associated with the suspect), they are compared in the laboratory by fitting the ends together. A photograph of the two pieces is taken to show the common origin. Figure 26 is a photograph of a comparison of two broken tools. The main body of the tools, recovered from the suspect's hip pocket, are shown on the right. The two broken pieces recovered from the crime scene are shown on the left. Note the concurrence of not only the broken surfaces, but also the striations left by the manufacturer on the screwdriver shaft and the damage due to use on the punch. From what has been said, it is apparent that, to be of value, broken metals recovered from the crime scene must be compared with broken objects recovered from the suspect, his vehicle or his residence.

Broken metal items discovered on the person of the suspect, in his vehicle or residence should be recovered by the investigator, marked and sent to the laboratory for comparison. Items should be wrapped in a clean piece of paper, sealed and placed in a suitable firm container.

If the object is large enough, it is marked on the unbroken surface using a marking stylus or a knife point. If the object is too small to mark, it is wrapped in a piece of paper, placed in a small, suitable container, sealed and the container is marked.

Where the piece of metal is embedded in another object and the intact object is to be sent to the laboratory, the investigator should mark the object, wrap it in a clean piece of paper or place it in an evidence bag, seal the container and record the necessary information on the outside. The laboratory will remove the broken metal for examination.

EXAMPLE OF PHYSICAL MATCH OF BROKEN TOOLS

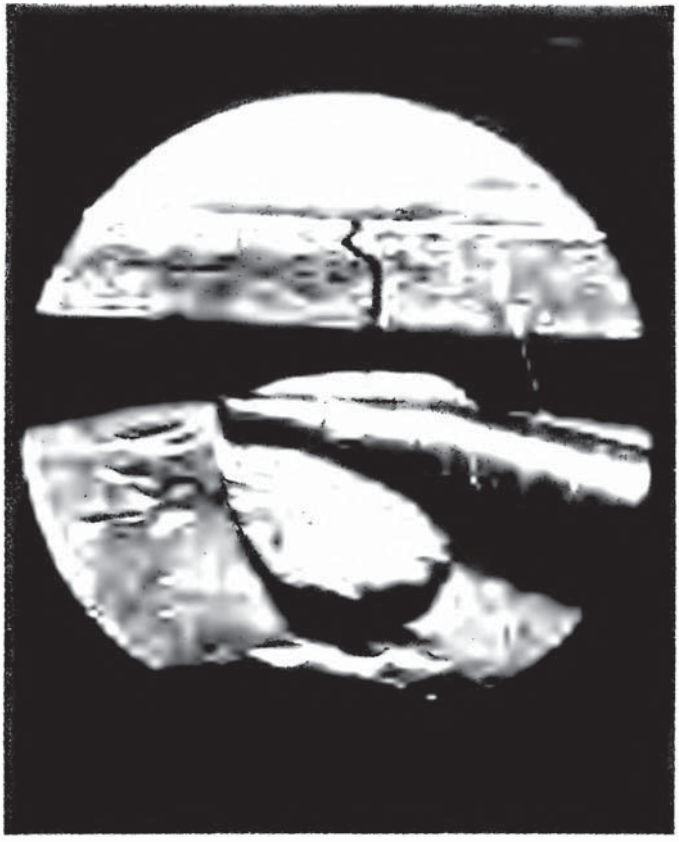


Photo: KCPD

Above, broken shank of screwdriver and a broken punch. Pieces at left were discovered on the scene. Pieces at right were recovered during search of suspect. Note concurrence at point of break, and also of the striations left by the manufacturer on the screwdriver shaft, and the damage marks on the punch.

FIGURE 26

CHAPTER XI

ILLEGAL DRUGS AND DRUGS THAT ARE SUBJECT TO ABUSE

INTRODUCTION

The fact that drug addiction and drug abuse are closely connected with crime need not be explored here. However, it is very useful for the police investigator to be aware of the classifications of the various types of drugs that are abused, the physical forms the drugs can have, and the ways they affect the user under varying conditions. All such information can sharpen the crime scene investigator's perception of physical evidence that is associated with illegal use of drugs. This chapter summarizes this type of information insofar as it seems useful for the purposes of crime scene search.

Some investigators mistakenly believe that the term "narcotic" covers all the controlled drugs and frequently use the term in this manner. Narcotic drugs are only those of addiction which are extracted from the opium plant and the leaves of the coca shrub.

The term "controlled drugs" is generally understood to include all drugs which are covered by law and are restricted in some manner. Because of the technical requirements of the courts it is better that the term "controlled drug" be used in the preliminary examination reports until a chemical examination can be conducted to determine the exact nature of the material.

DRUG ADDICTION AND ABUSE - IMPLICATIONS TO THE CRIME SCENE INVESTIGATION

From what has just been said concerning the scope of this chapter, it is apparent that the following is not presented as a definitive or comprehensive discussion of drug addiction and abuse. However, there are some basic points concerning these matters that are critical to the crime scene investigator's knowledge concerning drugs.

The first such point concerns the question of what is meant by the terms addiction and abuse. Addiction is primarily a matter of physical dependency of the user on the drug. When the addiction stage is reached, the user becomes sick if he is deprived of all he needs of the drug. Not all drugs have a physical dependence potential; however, most do. Some experts believe that in order for a person to become addicted to a drug (including alcohol) there must usually be some psychological maladjustment, and

that individuals with such maladjustments need only to be introduced to and supplied with the drug for addiction to occur. As noted, some drugs, such as marihuana, are not physically addictive in the sense that the user will become ill if deprived of it. However, there are indications that any drug can induce a psychological dependency on the part of the user. Generally, a drug addict feels an overpowering desire or compulsion to continue taking the drug and to obtain it by any means. He has a tendency to increase the dose, because his body develops a tolerance for the drug that dampens the feeling of well-being he originally got from smaller doses of it.

Although there has been much research, and considerable speculation, on the various reasons people take drugs, a reliable general conclusion seems to be that drugs provide a means of quieting anxiety and shutting out problems. The important conclusion is that drug use in the modern society is not restricted to the "hippy," the young, the poor, or the racial minorities,--the classic stereotypes, but has a pervasive use pattern at all levels of the society.

The drug user today, perhaps more than at any other time, is in danger of poisoning by taking "street" drugs. A 2-year program of analysis and study by Midwest Research Institute of abused drugs acquired in the Kansas City Metropolitan Region turned up repeated instances of capsules or pills that had a completely different content than that represented by the pusher. Some contained poisonous substances which, if taken in sufficient quantity, could have lethal consequences. Ironically, some others contained no drug substances at all. Added to this danger of misrepresentation is the one of overdose--to which the addict, by virtue of his tendency to increase his dosages--is particularly vulnerable. Thus, an apparent deliberate poisoning, a homicide, an accidental death, or a suicide can all involve drug consumption.

Drug abuse, as a general term used here, applies to any use of a drug, whether or not legally possessed, to the extent that the user has been or is likely to be adversely affected. (The terms "controlled" and "over the counter" or "noncontrolled" are frequently used synonomously with illegal and legal drugs, respectively.) Obviously, by that definition, even very low levels of the use of certain drugs by some people could qualify as abuse. In fact, as subsequent discussions will show, many drugs that have widely recognized medicinal value and are legally prescribed are also widely abused.

THE COMMONLY ABUSED DRUGS

Following are synopses of the various drugs or drug types that are often encountered by the police investigator. (Additional information concerning some of these types of drugs is presented in Table 1, pp. 122 and 123.

Heroin

This drug is a derivative of opium. It produces a "high" followed by a feeling of drowsiness and general well-being. It has a very high potential to create a physical dependency. It is usually taken by injecting it into the bloodstream, often using a modified eye dropper with a hypodermic needle attached as a syringe. Heroin can be sniffed; however, it has a very bitter taste, and is practically never taken orally unless encapsulated. Heroin is normally sold in "decks" and in clear gelatin capsules. For injection, the powder is dissolved in water, frequently in a bent teaspoon or metal bottle cap. The water is heated to boiling and the solution is then taken up through a cotton pledget into a needle and medical syringe or the type of modified eye dropper. Figure 27 shows some of the paraphernalia typically used to prepare and inject heroin.

The common physical evidence associated with heroin use is the equipment needed to prepare the solution and make the injection, and the glassine bags, papers, capsules, or other containers that are used. In conducting a search, it is well to bear in mind some of the characteristic actions of heroin abusers in protecting their supply. The addict will go to extreme lengths to do this. Capsules or decks of heroin are sometimes placed inside toy balloons or condoms to enable the user to quickly swallow them if surprised, and later recover them from the feces. Women have been known to hide heroin decks in their vagina or in their undergarments. Some addicts have concealed heroin decks under the tongue or along the side of the mouth. All containers should be collected by the investigator. They should be marked and secured in such a way as to insure that no loss of contents will occur. The container and the collected materials are then placed in a clean envelope or paper bag, sealed, marked with the necessary information, and forwarded to the laboratory for identification.

Heroin is only one of the several drugs that falls in the general classification of the narcotics. Since narcotics have generally the same appearance, the field investigator will normally not be sure what kind of drug he has encountered or if it is a drug. This lack of knowledge will apply, more often than not, to any suspected drug substance. Therefore, until chemical tests are performed by the crime laboratory, it is a good policy to refer to known or suspected drug substances only as "controlled drugs." In a report, a notation such as "Four clear capsules containing a white crystalline powder" would meet technical and legal requirements. In all cases, it is important to state clearly the number and description of each item in the investigative notes and in the report.

Cocaine

Cocaine is also a narcotic drug, but it is obtained from the leaves of the coca bush rather than from the opium poppy. It is a white, odorless, fluffy, crystalline powder, and thus closely resembles heroin in appearance. Also like heroin, it is commonly injected--sometimes sniffed. There are strong indications that a cocaine addict who has reached a high level of addiction (some inject the drug as many as 10 times a day)

TYPICAL ARRAY OF ITEMS USED BY THE HEROIN ADDICT

Photo: MRI

Clockwise: tourniquet, modified eyedropper, heroin capsules, heroin "deck", recovered syringe, matches for heating water and heroin solution in spoon. In spoon, cotton pledget through which the solution is taken up into modified eye dropper or the syringe.

FIGURE 27

is incapable of planning a deliberate crime. However, if this is so, the addict may still commit crimes of violence out of imaginary fear of imminent danger. Some individuals experience intense excitation and a great sense of muscular strength under the influence of the drug.

The search for evidence items is the same as described for heroin.

Marihuana

Marihuana is a mixture of parts of the leaves and flowers of the hemp plant Cannabis sativa. Because this drug is today so prevalent and in such wide use, it is the most likely to be encountered, either in its dried form or as a live plant. Figure 28 is a photograph of a cannabis leaf from which marihuana is prepared. Note the odd number of serrated blades having a common origin at the stem. There are usually five to seven blades to each leaf, but there may be as many as 21.

Material should be left in the container in which it was discovered. The material and the container are placed in a clean paper bag, sealed, and necessary information recorded on the outside of the bag. If possible, the original container of the drug should be marked before it is sealed in the bag.

Although marihuana may be eaten and the same effect attained, it is usually smoked. The cigarette sticks are usually rolled with two or three cigarette papers. Sometimes manufactured cigarettes are used by removing the tobacco filling and replacing it with marihuana. Various forms of pipes are also employed to smoke marihuana, ranging from the conventional tobacco pipe to hookahs, a form of water pipe (Figure 29). When burned, the drug gives off a sweet, pungent odor.

Marihuana has been known to be mixed with tobacco, catnip, dried leaves, and oregano. There have also been reports of deliberate "lacing"of the drug with addictive drugs such as heroin; however, this is definitely not a common practice.

The physical appearance of marihuana is sufficiently distinctive to allow an experienced investigator to identify it. Depending primarily on their state of dryness, the herbs are green to greenish brown in color, and usually hold some of the shape of the compression they were subjected to by the bulk processor (although this is not true of the "homegrown" supply). But even if identification of the drug seems fairly certain, it is good practice to describe it in the investigation records and reports only in terms of its physical appearance and approximate quantity.

Although marihuana usually has definite physical and psychological effects on the user, some persons experience nothing the first or second time they experiment with it; and many individuals have no manifestations that are discernible to others. Thus, the appearance of normality in a suspect does not exclude the possibility of fairly heavy and recent use of the drug.

MARIHUANA LEAF

Photo: KCPD

There will always be an odd number of serrated blades to the common stem, usually five to seven.

FIGURE 28

ITEMS COMMONLY ASSOCIATED WITH MARIHUANA USAGE

Photo: MRI

Clockwise from left: water pipe; marihuana and cigarette papers; home made pipes; a "roach" holder; marihuana cigarettes; a cigarette roller; and foil packets of hashish.

FIGURE 29

The evidence to be collected in connection with this drug is the smoking apparatus, the drug itself, any residues and ashes resulting from smoking, particularly the contents of ashtrays, and paper and other containers that may have been used.

Hashish

Hashish is far more potent--and dangerous--to the user than is marihuana. It is in the form of a brown powder or is pressed into blocks or small pieces. It is frequently wrapped in small, tinfoil packets. However, it has been known to be mixed wtth instant coffee in an attempt to disguise it. Hashish may be either eaten or smoked--but it is usually the latter. Thus, the search is basically the same as for marihuana, allowing for the different bulk and appearance of the two drugs. While hashish is stronger than marihuana, its possession and sale still constitutes the offense of possession or sale of marihuana.

Hallucinogenic Drugs

These drugs, of which LSD, PCP and MDA are the most commonly abused, act on the central nervous system and on the psychic and mental functions. They produce visions, images, and dream-like thoughts--frequently very frightening. The user is usually unable to distinguish between fact and fantasy. LSD is available in most metropolitan areas in several forms--sometimes to the great detriment of the buyer who thinks he is getting something else. Foil packets, small tablets, small vials of liquid saturated sugar cubes or cookies, chewing gum, and capsules are relatively common forms of the drug's packaging. Foil is used to protect LSD from light, which reduces its strength. Foil should therefore be left intact when encountered.

Natural hallucinogens like mescaline and psilocybin are seldom encountered. The drugs purported to be mescaline and psilocybin are usually LSD and PCP.

Since all the hallucinogens are very powerful and can be absorbed through the skin, the investigator should not handle the material more than is absolutely necessary.

Barbiturates

These are a group of sedative and sleep-producing drugs that act on the central nervous system. They are usually taken orally, but they can also be used intravenously or rectally. Because they are prescribed frequently by physicians, their presence on a crime scene does not automatically indicate criminal intent or wrong doing. However, it is well to note that this type of drug is the most often used means of committing

nonviolent suicide. Most of the barbiturates are legally manufactured preparations, ranging from tablets, capsules, and suppositories to liquids. The best indication of abuse of these drugs is in the quantity of supply found. Abusers have been known to take as many as 40 barbiturate pills a day. The use of the barbiturates also often follows the excessive use of amphetamine drugs, which are discussed below, in order to "slow down." Therefore, amphetamines and barbiturates may be discovered together.

The use of alcohol before or along with the barbiturates may result in a "quick drunk" and possible death from respiratory failure. Both alcohol and barbiturates are depressants and their actions are additive. Also, the barbiturates interfere with the body's normal disposition of alcohol.

Common types of barbiturate drugs are:

- Pentobarbital sodium
- Secobarbital sodium
- Amobarbital sodium with secobarbital sodium
- Amobarbital sodium
- Phenobarbital

Amphetamines

Contrary to the barbiturates, which are used medically to relax the central nervous system, amphetamines directly stimulate that system and produce excitation, alertness, and wakefulness. The degree of these effects depends on the dosage. They are commonly prescribed as an appetite depressant. Normally taken orally, amphetamines may also be injected. The drugs are produced in a wide variety of physical forms.

Because amphetamines are available only through prescription, any such drugs collected should be left in the container they were found in, if any. The container should be processed for prints, the material examined as noted below; then sealed, marked and placed in a clean envelope or paper bag. This outer container should also be sealed and and marked.

Amphetamines, or materials suspected to be such, that are not in a container should be suitably packaged, sealed, and marked.

Most amphetamines found will be of legal manufacture. There are a number of dosage forms--tablets and capsules being common. The investigator should note, and include in his report, the quantity, color, and shape of all tablets and capsules. If there are markings on tablets, those should be recorded exactly. If the appearance of the material inside a capsule can be determined without opening it, that information should be recorded as well.

As with all other suspected drug substances, the investigator should be cautious in making an identification based only on the physical appearance of the material. Prior to its analysis by the laboratory, it is always good practice to refer to the material in the notes and report in terms of its physical description and quantity.

Some examples of amphetamine drugs legally manufactured are:

- Amphetamine sulfate
- Long-acting amphetamine sulfate capsules
- Dextroamphetamine sulfate

Methamphetamines

Methamphetamine (most commonly known as "speed") is chemically related to amphetamine but it has more central nervous system activity and correspondingly less effect on blood pressure and heart rate than amphetamine.

The abuse of methamphetamine is more widespread than ever before. Many abusers "shoot" (take intravenously) methamphetamine and eventually may build up to more than 100 times the medicinal dose. Thus, it is not surprising to discover these persons in an acute toxic state with death as a possible outcome. Methamphetamine for medical purposes is available on prescription only. It is available commercially under a variety of trade names. However, it is also manufactured in clandestine laboratories and is available in illicit channels as a crystalline powder in tablets, and in a variety of liquid forms.

Toxic Vapors

It has become relatively common practice among persons who experiment with drugs to intentionally smell or inhale the fumes of certain substances in the hope of achieving a condition of intoxication or euphoria (feeling of well-being or elation). Model airplane glue is a typical such substance used for "sniffing." However, inhaling fumes from gasoline, paint thinner, carbon tetrachloride, fingernail polish, acetone, and toluene will also produce forms of intoxication. The common practice is for the user to pour the substance into a plastic or paper bag, then place the bag tightly around the nose and mouth and inhale deeply. While such practice will usually produce only a blurring of vision, and other symptoms of intoxication, suffocation is always a distinct possibility as a result of the user breathing only vapors. If a death or serious injury

has occurred as a result of the deliberate inhalation of toxic vapors, there will usually be a distinct odor of the solvent about the person's clothing or on his breath, if he is still alive.

Evidence items to be searched for are plastic or paper bags with residues of the substance inhaled, rags or handkerchiefs containing dried material and possibly vomitus.

Some Important Cautionary Rules in Collecting Drug Substances

Some of the points summarized below have been made elsewhere in this chapter. However, because of their importance to the safety and health of the investigating officer, they bear repeating.

- IF AN ILLICIT LABORATORY OPERATION IS ENCOUNTERED AND A SCIENTIST FROM THE CRIME LABORATORY IS NOT PRESENT, DO NOT ATTEMPT TO SHUT DOWN THE OPERATION. VENTILATE THE AREA, CALL FOR ASSISTANCE AND WAIT OUTSIDE. IF AN ILLICIT LABORATORY OPERATION IS ANTICIPATED, INCLUDE A MEMBER OF THE CRIME LABORATORY STAFF IN THE RAID.

- NEVER TASTE ANY MATERIAL SUSPECTED OF BEING A CONTROLLED DRUG.

- NEVER SMELL MATERIALS SUSPECTED OF CONTAINING CONTROLLED DRUGS.

- DO NOT HANDLE CONTROLLED DRUGS MORE THAN IS ABSOLUTELY NECESSARY. AFTER DRUGS HAVE BEEN HANDLED, WASH HANDS THOROUGHLY AS SOON AS POSSIBLE.

- HANDLE ALL CHEMICAL MATERIALS RECOVERED WITH CARE. THEY MAY BE HIGHLY FLAMABLE, CAUSTIC (BURN THE FLESH) OR SUSCEPTIBLE TO EXPLOSION.

- USE PARTICULAR CARE IN SEARCHING A DRUG SUSPECT, AN AUTOMOBILE SUSPECTED OF CONTAINING DRUGS OR ANY AREA WHERE IT IS POSSIBLE THAT HYPODERMIC SYRINGES OR MAKESHIFT NEEDLES MAY BE HIDDEN. EVEN SLIGHT PRICKS IN THE SKIN FROM SUCH NEEDLES CAN BE DANGEROUS IF THE DRUG USER HAS A COMMUNICABLE DISEASE. INFECTIOUS HEPATITUS IS COMMON AMONG PERSONS WHO "SHOOT" DRUGS. IF THE SKIN IS PUNCTURED, WASH THE AREA WITH SOAP AND WATER AND GET MEDICAL ATTENTION.

The Use of Field Test Kits for Identification of Suspected Drug Substances

There are commercially available kits that allow police officers in the field to make presumptive tests of suspected drug substances. Such kits vary in degrees of reliability and the type drugs to which they are specific; however, detection of barbiturates, amphetamines, heroin, cocaine and marihuana are commonly within the detection range of the better ones.

The use of field testing devices to identify suspected drugs has the principal advantage to the police investigator of saving time. However, the disadvantages are the potential for error and the inability to detect a dangerous substance that is not within the range of the kit or procedure being used.

Virtually every crime laboratory in the United States has developed a primary capability in the identification of suspected drug substances, with degrees of reliability in the analytical results that far exceed any that could be attained by use of field test kits. Therefore, the recommended procedure is to utilize the services of a laboratory for this purpose.

TABLE I

INVESTIGATING OFFICER'S GUIDE TO CERTAIN ABUSED DRUGS

NAME	SOME STREET NAMES	CHEMICAL OR TRADE NAME	HOW TAKEN	DEPENDENCE POTENTIAL
HEROIN	H., Horse, Scat, Smack, Junk, Snow, Harry, Joy Powder	Diacetylmorphine 'Depressant)	Injected Sniffed	Physical and psychic
MORPHINE	White stuff, Miss Emma, M., Dreamer	Morphine Sulfate 'Depressant)	Swallowed Injected	Physical and psychic
CODEINE	Schoolboy	Methylmorphine (Depressant)	Swallowed	Physical and psychic
MARIHUANA	Pot, Grass, Locoweed, Mary Jane, Hashish, Tea, Indian Hay, Giggle Weed, Giggle-smoke	Cannabis Sativa (Stimulant, depressant or hallucinogen, depending on user.)	Smoked Swallowed (Hashish, the concentrated form, may be sniffed.)	No physical dependency; possible psychic
COCAINE	Speed Balls, Gold Dust, Coke, The Leaf, Snow, Star Dust	Methylester of benzoylecgonine (Stimulant)	Sniffed Injected Swallowed	Psychic
AMPHETAMINES	Bennies, Dexies, Co-Pilots, Wake-ups, Footballs, Hearts, Pep Pills, Speed	Benzedrine, Preludin, Dexedrine, Methedrine, Dexoxyn (Stimulants)	Swallowed Injected	Psychic only
BARBITURATES	Red Birds, Yellow Jackets, Dandy, Phennies, Peanuts, Blue Heavens	Phenobarbital, Nembutal, Seconal, Amytal (Depressants)	Swallowed Injected	Physical and psychic
HALLUCINOGENS (LSD and DMT)	LSD, Acid, Sugar, Big D, Cubes, Trips, etc. DMT - Businessman's High	d-lysergic acid diethylamide (LSD) Dimethyltryptamine (DMT) (Hallucinogens)	Swallowed (LSD) Injected (DMT)	No physical dependency Psychic dependency uncertain
MESCALINE	Cactus, Peyote	3,4,5-trimethoxyphenethylamine (Hallucinogen)	Swallowed	No physical dependency Psychic dependency uncertain

CONTINUED

PRIMARY EFFECT ON USERS	SYMPTOMS THAT HELP IDENTIFY USERS	SOME DANGERS OF ABUSE
Generally sedative - rarely does it excite. Initial reaction may be unpleasant; but soon subsides to drowsiness and feeling of well-being.	Slow pulse and respiration. User is drowsy, very calm in demeanor when under the influence of the drug. Loss of appetite. Overdose may produce convulsions. Pupils of eyes constricted.	High rate of dependence. Must increase dose to obtain the desired effect. Drastic withdrawal symptoms. Because the drug is a respiratory depressant, can cause coma and death. User has no ability or desire to do constructive work. When deprived of the drug, becomes extremely agitated and uncomfortable.
Heroin-like	Like heroin, but somewhat slower to act.	Like heroin, except that dependence may develop somewhat slower.
Deadens pain and is a cough suppressant. Very little of the feeling of well-being produced by heroin and morphine.	Large doses, taken intravenously, are required to produce manifestations of effects similar to heroin and morphine. Usually not much evidence of effect from oral dosage.	Can be addictive; however, only when taken in large amounts. For obvious reasons, seldom used by hardened addicts, except to tide over during periods when heroin or morphine are not available.
Initial use may produce no particular effect; later feeling of great perceptiveness, distortion of time and space, possibly erratic behavior, unwarranted hilarity, feeling of great pleasure.	Exhilarated, talkative, but may only sit and stare. Exaggerated sense of ability is common. May experience and verbalize "visions." The effect is personality dependent to a great degree. Thus, very difficult to generalize.	May lose normal restraint and reserves, thus, attempt acts that are dangerous. Seldom produces aggressive behavior. A psychic dependence is possible.
Oral doses can relieve hunger and fatigue. Intravenous doses can cause great excitability and manical behavior; hallucinations.	Manical behavior, hallucinations, muscular twitching, possibly convulsions. Pupils are dilated, and the individual is generally hyperactive.	Paranoia, possibly convulsions, and death from an overdose. There is a very strong psychic dependency potential with this drug, but apparently no physical dependency.
Normal dose can produce a wakeful attitude, increased alertness, and initiative.	If the user has taken an intravenous dose, may exhibit cocaine-like effects (manical behavior). May exhibit an unusual degree of "nerve."	Because of the lessened sense of personal danger, the drug may cause the user to become dangerous to himself and others. Prolonged excessive use can cause erratic and aggressive behavior.
Small doses serve to relax, make good humored. With dose progression, the individual becomes sluggish and sedated.	Abuse of the drug will produce behavior that is very much like alcohol drunkenness. Such behavior in the absence of the odor of alcohol, is strong indication of barbiturate use.	Coma and death from respiratory failure. Convulsions and severe withdrawal symptoms also probable with abuse. Very hazardous when taken with alcohol.
Hallucinations are almost invariably produced. Depression, exhilaration, serious mental changes common.	Complete personality changes are possible. May "see" smells and "hear" tastes. Generally irrational behavior and verbalizing.	Permanent mental derangement is always a danger. Individuals perceive false ability (to fly, for example) and thus may commit dangerous acts. Possibility of recurrence of hallucinations or psychotoxic episodes weeks after taking the drug.
Produces a feeling of exhilaration in many users. Others experience anxiety.	As noted at left. In addition, the individual may complain of gastric distress.	The long-term effects of heavy use are uncertain.

CHAPTER XII

CHEMICAL MATERIALS

POISONS

Cases of suspected poisoning frequently pose very difficult problems to the police investigator and to the medical examiner. Many poisons produce symptoms similar to those of certain diseases, a fact that can complicate determination of whether a crime has been committed. However, if there is any reason to suspect poisoning, the investigation must proceed along the lines of a possible homicide, suicide or accidental death, until death due to natural causes is established.

Actually, poisons are now rarely used in homicides because their physical properties usually alarm the intended victim. In addition, modern laboratory techniques can readily detect most poisons, thus unmasking the intended homicide coverup. But when they are used, poisons cover a very wide range of possibilities.

To further compound the problem, suicides and accidental deaths by poisoning are sometimes very difficult to distinguish from the homicide. Alcohol, when consumed with certain medications, may result in an accidental (possibly suidical) death caused by respiratory failure. An example is the combination of amphetamines and alcohol. When the alcohol level in the blood reaches about half the lethal dose, most individuals will "pass out" and thus stop drinking. But with the addition of a stimulant, such as an amphetamine, this may not occur, and the individual may drink a lethal dose of alcohol before he falls into a coma.

Accidental death due to poisoning may result from occupational hazards, carelessness in taking medicines, and improper installation or maintenance of machinery or equipment to cite but a few examples.

Even though the crime scene investigator will seldom be able to identify the chemical compound which caused the death, he should be alert to the general range of possibilities and the potentially hazardous environmental factors that can be connected with a poisoning.

Regardless of the nature of the incident--homicide, suicide, or accident--the symptoms of death for a given poison will be the same. The field investigator should attempt to determine if the victim had any of the symptoms of vomiting, convulsions, diarrhea, paralysis, rapid or slow breathing, contracted or dilated pupils, changes in skin color,

or difficulty in swallowing just prior to death. These symptoms are general manifestation of systemic poisoning. They do not provide proof of poisoning but can be meaningful in relation to other evidence.

A witness who observed the victim just prior to death provides the best source of information concerning his symptoms. If no witness is available, the investigator must place an even greater reliance on physical evidence available at the crime scene.

The investigator should collect all available information concerning the activities of the victim during the last 3 days of life. Information such as types of medication taken, and when, the last meal and where it was eaten can be very important in determining the type of poison involved. Prior medical history may indicate that death was due to natural causes.

The toxicologist is concerned with the identification and recognition of poisons, with their physiological effects on humans and animals; and with their antidotes. Crime laboratories usually provide some toxicological support, but vary considerably in the amount and type of such support they are able to furnish. However, full toxicological support is always available through a combination of the capabilities of hospital and medical examiner, coronor laboratories, and criminalistics laboratories. The crime laboratory is able to direct police to the local facility able to provide services it is unable to furnish.

Table 2 lists some common poisons and their associated symptoms of physical manifestations.

Table 2 is not a comprehensive checklist of all possible types of poisons. However, it is a reference concerning the common possibilities and their associated physical manifestations. The determination of the presence of a poison and its nature are functions of the crime laboratory or the coroner's office. However, that task will be greatly eased if the investigator is able to report accurately pertinent information from his examination of the crime scene.

If the investigator suspects poison was used or was accidentally taken, a diligent search should be conducted for the container. In the case of suicides and accidental poisonings, the container will frequently be close at hand. Even though a container appears empty, it should be processed for fingerprints (if the surface is nonporous), packaged, marked, and forwarded to the laboratory for examination. Additionally, any other object that could reasonably relate to the poisoning should be collected, such as unwashed dishes and glasses, wastebasket contents, envelopes, and medicine containers.

All items collected in a suspected case of poisoning are marked and packaged in accordance with previous discussions of related type evidence, and sent to the crime laboratory for analysis.

TABLE 2

POISONS AND ASSOCIATED PHYSICAL MANIFESTATIONS

Type of Poison	Symptom or Evidence
Caustic Poison (Lye)	Characteristic burns around lips and mouth of victim
Carbon Monoxide	Red or pink patches on chest and thighs
Sulfuric Acid	Black vomit
Hydrochloric Acid	Greenish-brown vomit
Nitric Acid	Yellow vomit
Silver Salts	White vomit turning black in daylight
Copper Sulfate	Blue-green vomit
Phosphorous	Coffee-brown vomit, onion or garlic odor
Cyanide	Burnt almond odor in air
Ammonia Vinegar Lysol Etc.	Characteristic odors
Arsenic, Mercury, Lead Salts	Pronounced diarrhea
Methyl (Wood) Alcohol Isopropyl (Rubbing) Alcohol	Nausea and vomiting, unconsciousness, possibly blindness

The investigator may be called on to investigate dog poisonings. While there is usually reason to suspect poisoning in the case of an unexplained death of a dog, it should also be noted that such deaths can occur as a result of heavy bacterial ingestion. This possibility applies particularly to dogs allowed to roam free, and most particularly in the spring of the year. During the winter a number of wild animals die and are frozen. During the spring thaw, the tissue of the animal provides excellent culture medium for bacterial growth. If such tissue is eaten by a dog, the sudden overdose of certain microorganisms can cause death that is symptomatic of strychnine poisoning. Heart failures may also be the cause of death, particularly in the case of a dog that has undergone unaccustomed physical exertion.

ALCOHOL

Alcohol may figure significantly in the investigation of almost any type of crime. Beverage alcohol becomes important clue material in an attempt to link a poisoning case with alcoholic drink. There is usually good reason to suspect that alcohol may have been the medium for a poisoning because it can serve as a good solvent--and frequently a taste cover--for many kinds of poisonous substances. Alcohol can itself be poisonous (isopropyl or rubbing alcohol, for example). The investigator should not overlook the possible poisonous effect of beverage alcohol when taken with certain drugs or simply in sufficient quantity; however, this type of use is normally not crime connected.

Alcoholic Poisoning

In all cases in which alcoholic poisoning is suspected, or which involve the discovery of alcoholic substances that may have been consumed, the crime laboratory should be requested to make analyses of samples of the liquids and also to determine the blood alcohol content of victims.

Some care must be taken in collecting samples of alcoholic beverages--particularly mixed drinks. If ice is still in a drink, it should be removed immediately in order to prevent further dilution of the alcohol and any poisons the drink may contain. The liquid should then be transferred to a clean glass vial and tightly sealed. (The original glass should, of course, be properly processed for fingerprints, if appropriate, and should itself be returned to the laboratory for examination.) If possible, the container to which an alcohol sample (normally about 1 to 2 ounces) is transferred should not be much larger than necessary to hold it. A large airspace above the liquid sample will result in some of the alcohol content being lost through evaporation. This evaporation loss will be higher if the base of the drink is a carbonated beverage.

Blood alcohol examinations are usually conducted to determine the degree of intoxication. Blood samples must be carefully handled to prevent any loss of the volatile alcohol. Three to five cc. of the blood are required.

Blood samples taken from an individual for the purpose of determining blood alcohol content should be drawn by medical personnel. The investigator should be present, if possible. His presence will frequently obviate calling the doctor, nurse, or technician as a witness. The name of the person drawing the sample should be included in the identifying information on the outside of the container. Inclusion of this information is absolutely necessary if the investigator was not present when the sample was drawn.

It is also important to request the person taking the sample to not use alcohol or alcohol base preparations to clean the skin in the area where the needle will be inserted.

The investigator should request that the drawn blood sample be placed in a sealed test tube containing anticoagulant. A tube with a rubber injection stopper is preferred. The sample should be injected through the rubber stopper and the blood thus prevented from coming into contact with the outside air. When this type container is not available, a regular test tube may be used if it is quickly sealed after the sample is transferred to it.

After the container is sealed, the investigator may place a piece of adhesive tape on the outside of the tube and write all the required information on it. The sample should be forwarded to the laboratory as soon as possible.

If tests other than blood alcohol are required, such as blood type, drug content and poison content, the investigator should include the request on the sample container, or in a report sent to the laboratory with the sample.

In summary when collecting liquids known or suspected to contain alcohol:

- Use clean containers,
- Keep the airspace above the liquid at a minimum,
- Seal the container tightly, and
- Mark the container properly.

CHEMICAL MATERIALS RESULTING FROM EXPLOSIONS

Explosions may be diffused--covering a large area--or they may be concentrated at one point. Both types of explosions have distinct characteristics in terms of precipitating conditions and tell-tale aftermath.

Diffuse Explosion

Diffuse explosions may occur as a result of the ignition, within an enclosed area, of natural gas, vapors from volatile liquids, or dusts from cotton or grains. Many diffuse explosions thus occur accidentally. In most cases a diffuse explosion will create no crater area of special damage or discoloration. It may or may not be followed by a fire, depending upon the conditions at the time of ignition. The concentration of the explosive material will vary according to the prevailing drafts, source of the vapor, and the general structure of the building.

The nature of the exploding material may often be determined by examination of the structure. If the explosion was caused by vapors which are lighter than air, such as natural gas, the explosion will tend to push out the walls of the structure near the top, usually causing the ceiling to collapse. An explosion of vapors which are heavier than air, such as gasoline and kerosene, will tend to push out the walls near the bottom. Figure 30 depicts an explosion of this type. Therefore, an examination of where the structural damage occurred can yield valuable indicators as to the type of explosive material.

In diffuse explosions the primary force is the most important one. There is very little, if any, of the "return" force or implosion that is frequently characteristic of the more concentrated form.

Concentrated Explosion

In concentrated explosions, by contrast, the secondary force may be the most important one. Following the explosion, particularly one of a high order, there is a return force (implosion) which is the opposite of the first. Frequently, the first force or explosion merely weakens a structure and the implosion causes it to collapse.

Materials which can produce a concentrated explosion include, among others, black powder, smokeless powder, nitroglycerin, dynamite, TNT, and plastic explosive compounds (such as composition C_4). In contrast to the diffuse explosion, oxygen is not a prerequisite to ignition of these materials. Some of the materials that produce concentrated explosions may continue to burn and produce expanding gases for a relatively long period after ignition--black powder and smokeless powder are examples. Others, such as nitroglycerin, TNT and the plastic compounds decompose or burn very rapidly.

The most distinguishing factor in concentrated explosions resulting from nitroglycerin, TNT, dynamite, etc., is local shattering and the presence of a crater. These explosions expand in all directions, not just upward. The extreme speed at which these materials decompose creates large volumes of hot gases very quickly which are capable of shattering solid materials when they are encountered. Those forces which were originally directed downward develop a crater and then change direction when the initial pressure from the gases moving in other directions are reduced. (Samples of the soil from all craters should be collected for examination by the crime laboratory.)

EXAMPLE OF THE EFFECT OF EXPLOSION OF
VAPORS HEAVIER THAN AIR

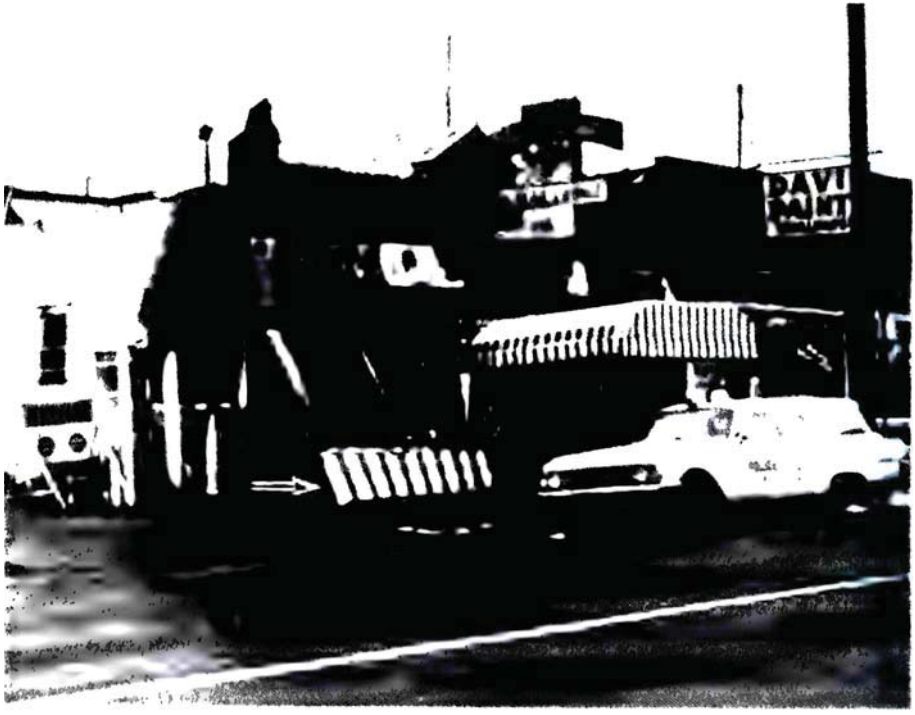


Photo: KCPD

Note the wall pushed out at the floor, a characteristic of this type explosion.

FIGURE 30

The materials required to prepare black powder may be purchased at almost any drug store. It is prepared from charcoal, sulfur, and sodium nitrate. Black powder is easy to ignite and, therefore, is a favorite for homemade devices. When this material is confined in some type of container, such as a metal pipe, it may be detonated with almost any type of simple fuse.

Smokeless powder is essentially nitrated cotton with other ingredients added to retard decomposition or deterioration of the powder. It is more powerful than black powder. This material is rather insensitive and ignition is relatively difficult. It is chiefly sensitive to heat. Unconfined smokeless powder will burn and will detonate if burned in large quantities. It will explode with great force if closely confined and detonated properly.

If either black or smokeless powder was involved, the investigator should be able to find unburned or only partially burned particles that were blown outward from the center of the blast. Fragments of the container or the ignition device used may also be found embedded in objects or surfaces along the leading edge of the explosive force. Such materials have very high evidence value, and should always be searched for carefully.

All materials collected for examination by the laboratory should be placed in suitable containers, sealed, and marked with all pertinent information.

A careful sketch and photographs should be made of the entire area.

All of these explosive materials require a blasting cap of some type for detonation. The cap may be attached to a powder fuse or it may be detonated electrically with some type of timing device.

When high order explosions are encountered, all the crater material should be collected, sealed, and forwarded to the laboratory for examination. The collected material should not leak from the container.

When local shattering occurs, the area should be examined in detail for the materials used to make the explosive device. The explosive is usually packaged. Several sticks may simply be taped together and a blasting cap inserted. But the container may be more elaborate and, therefore, assume more significance to the investigation. If a powder fuse was used, fragments of it may be found some distance from the crater. If electric blasting caps are used, some evidence of the leg wires and the timing device should be present.

When a regular powder fuse is used as a timing device, it is frequently wrapped around the explosive material so that the evidence of its presence will be consumed or scattered. A search should be made in these areas for fragments of the fuse.

Every effort must be made to collect all materials that are part of the explosive device. A diligent search may be required over a very large area. The more elaborate the device, the greater the opportunity to trace it to the person who prepared it. All materials collected should be sealed in suitable containers and marked with the necessary information before being sent to the laboratory for examination.

The suspect's hands can be swabbed with acetone or methyl alcohol to determine the presence of explosives such as dynamite.

THE INVESTIGATION OF FIRE

Fires pose particularly knotty problems to the police investigator. The basic determination to be made is whether the fire occured accidentally or was intentionally set. In the final analysis, the proof of intent to set the fire is fundamental to the outcome of the investigation. It is in this connection that physical evidence assumes particular importance.

Arson is committed for a variety of reasons. However, the most common are to cover other crimes, to defraud an insurance company, or to satisfy malicious, vengeful or psychological motives. In most cases involving fire, the police investigative problem will be considerably complicated by the fact that most, perhaps all, of the physical evidence that would support determination of its origin will have been destroyed or drastically altered. This constraint places even greater than usual emphasis on the thoroughness of the search procedures applied to a fire scene.

Even though all the combustible material has been destroyed in a fire, there is still the possibility that valuable clue material can be collected. Solid materials may be found which are foreign to the scene. The presence of a metal fuel container in an area where its presence would normally be very unlikely, such as the living room of a dwelling, would be strong indication of arson. On the other hand, the presence of such a container in the garage area of the house would offer no lead unless it showed evidence of having been altered or tampered with in some way to make it the deliberate ignition point.

The best evidence, and the highest probability that any will be found, centers around the area of the fire's origin. In searching for the origin, the investigator must take into consideration drafts, prevailing winds, and the fact that in the absence of air currents or drafts a fire will travel upward more rapidly than it will laterally. Materials above the point of origin will thus be more likely to ignite first. This material may fall and begin secondary fires. Usually, the charring around these secondary fires will be less than at the initial point of origin.

Evidence of several points of origin is usually reasonable grounds to assume that an arson has been committed. Each area of origin (or apparent origin) should be searched thoroughly for any evidence of volatile materials such as gasoline, benzene, rubber cement, and so forth. These materials may be soaked into rags, wall plaster, and charred wood. Frequently, the sense of smell is the best lead. Any porous materials that give off the scent of some accelerant should be sampled and the sample tightly packaged as quickly as possible. Airtight containers are a must in this regard. A clean, wide-mouthed Mason jar, or any other clean container that can be sealed to prevent air leaks is suitable. However, plastic bags should not be used because some volitile materials dissolve plastics.

The ignition devices used in arson cases are particularly high quality evidence. Many of the devices used to delay ignition, such as matches, candles and cloth wicks, are easily consumed in the fire. However, it is not uncommon that unconsumed particles of even these devices may be discovered. Metal devices, such as cigarette lighters and soldering irons, are used as igniters and these may often be identified no matter how extensive the destruction of combustible materials. The more elaborate the ignition device, the more valuable it will be as evidence. The way a device is put together is frequently as valuable as evidence as what it consists of. Therefore, before collecting or moving any device it should be fully recorded in the notes and sketches, and photographed.

If burned documents are important to the case, as they frequently are in arson committed to cover a fraud, the undistrubed paper ash is very important evidence. The means of collecting such ash and processing it in the criminalistics laboratory is considered in Chapter XV, Questioned Documents.

CHAPTER XIII

PREPARATION OF CASTS AND COLLECTION OF RESIDUAL PRINTS

INTRODUCTION

The criminal frequently leaves behind traces of his wearing apparel, his footgear, tools used to force an entry, or his automobile. All such traces can be valuable evidence. Probably the two most common types of such evidence are impressions left by footwear and by automobile tires. By comparing the discernible impression with what is suspected to be the actual item, it is frequently possible to establish or disprove identity.

There are two means by which impressions can be reproduced: photography and casting. As a general rule, photographs (which include a scale) are taken of all impressions which cannot be traced to persons legally at the scene. Casts are prepared when the impression has sufficient detail to make identification of individual characteristics possible.

Choice of Casting Materials

Plaster casts will accurately reproduce details which are visible to the unaided eye. But plaster is not suitable for impressions which could yield microscopic details, such as a tool mark in metal. When tool marks or other very detailed impressions are to be cast, silicone rubber material should be used.

The General Rules for Processing Impressions

The procedure for recording the discovery of foot and tire impressions follows the same pattern as for other items of evidence. Their discovery should be entered in the investigating officer's notes. Photographs should be taken to record the details of the impression and its location with respect to other items of evidence and with the crime scene generally. A ruler must be placed in the photo field to indicate scale. However, the following additional data should be recorded before making a cast:

> The dimensions of the impression or impressions should be noted as accurately as possible. In taking measurements, it is very important that the impression not be accidentally marred.

- The design pattern should be sketched by the officer and any discernible trade names or devices in shoe sole impressions should be noted.

- The date and time of day of the discovery should be noted, together with a description of the general physical condition of the impression (deteriorated because of rainfall, covered partly by snow, water standing in, etc.).

- It may be possible to estimate the time the impression was made by relating it to such an event; however, any estimate should be made cautiously and only after considering all the facts.

- The type of soil in which the impression was made (i.e., red clay, sandy, leaf mold, etc.).

Protecting the Impression

Foot and tire impressions are exceptionally fragile. In the face of any environmental threat, such as rain, snow, and high winds, one of the first concerns of the investigator is to protect the impression from erosion. Photograph the impression, (including a scale in the picture) as soon as possible after discovery. Some form of waterproof cover will suffice as protection from precipitation; however, if it is windy, a cardboard or solid wood box heavy enough to resist the wind pressure should be placed so as to surround the impressed area.

Preparation of the Impression Before Casting

The procedures for preparing an impression and making a cast are illustrated in Figure 31. Impressions in dust or sandy soils must be carefully prepared to allow them to support the weight of the casting material. After carefully removing twigs, leaves, and other extraneous materials, the impression should be sprayed with a fast drying silicone preparation. When dry, this preparation reinforces the impressed details. The silicone preparation usually takes from 5 to 10 minutes to dry.

It is possible to damage the impression by directing the silicone spray directly on it. Therefore, a piece of cardboard should be used to deflect the spray, or the nozzle of the spray can should be held far enough away from the impression to insure that the propellant gases do not exert force against it. If a box windbreak has been placed around the impression as noted above, it may be possible to remove the top of the box and then direct the silicone spray over its top, allowing it to settle over the impression.

The decision to use silicone spray rests on the degree of compression and firmness of the impressed area. But when in doubt as to the condition of the impression, use the spray.

METHOD OF PREPARING AN IMPRESSION AND
MAKING A PLASTER CAST

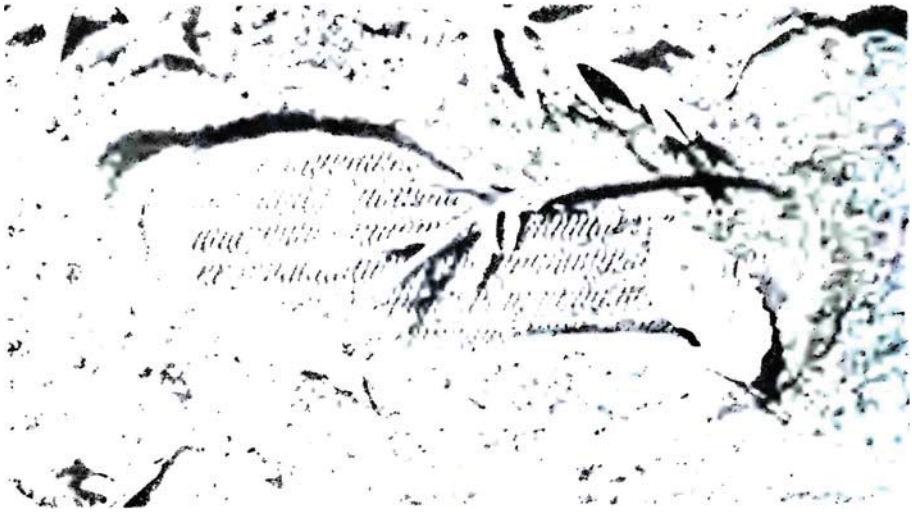


Photo: MRI

The impression is first carefully cleaned of debris.

Photo: MRI

The impression is then sketched and photographed. Note that scale must be included.

FIGURE 31

METHOD OF PREPARING AN IMPRESSION AND MAKING A PLASTER CAST (Continued)

Photo: MRI

Spraying with silicone preparation. Note use of the baffle to deflect the spray onto the impression. This procedure avoids danger that propellant gases will damage the detail of the print. Silicone preparation is used where the degree of compression and firmness of the impression is not high.

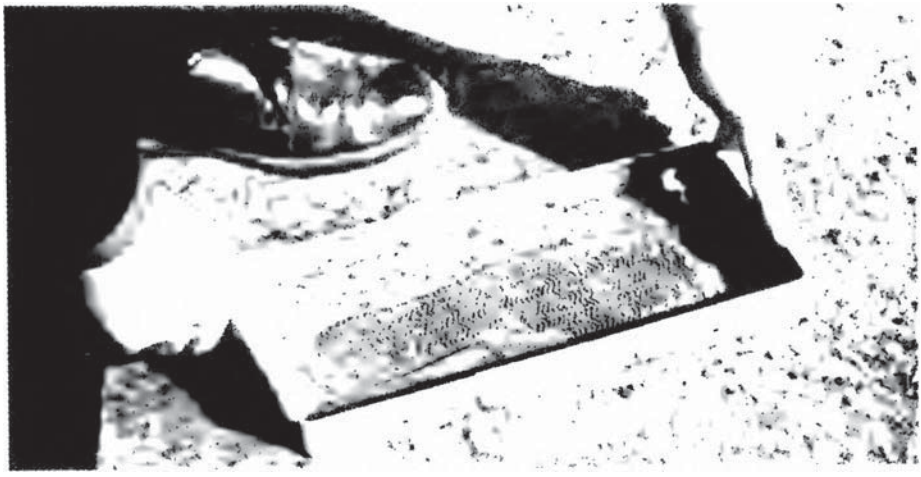


Photo: MRI

Metal casting frames are set in place.

FIGURE 31 (Continued)

METHOD OF PREPARING AN IMPRESSION AND
MAKING A PLASTER CAST (Continued)

Photo: MRI

Preparing plaster. About enough water is poured into rubber mixing bowl as would fill the impression. Then dry plaster is added until tip of a mound just breaks the surface.

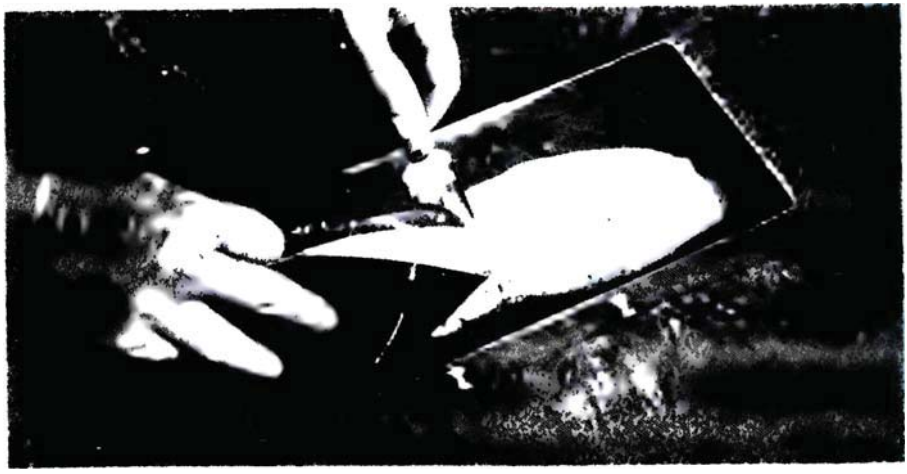


Photo: MRI

Making first pour, using spoon as a baffle to break the fall of the mixture. Pour is made continuously from one end of impression to the other until about 1/2 inch of plaster is standing in the impression.

FIGURE 31 (Continued)

METHOD OF PREPARING AN IMPRESSION AND MAKING A PLASTER CAST (Continued)

Photo: MRI

Adding strips of wire mesh as reinforcement.

Photo: MRI

After restirring, the remainder of the mixture is added.

FIGURE 31 (Continued)

METHOD OF PREPARING AN IMPRESSION AND MAKING A PLASTER CAST (Concluded)

Photo: MRI

Before hardening, the identifying information is added.

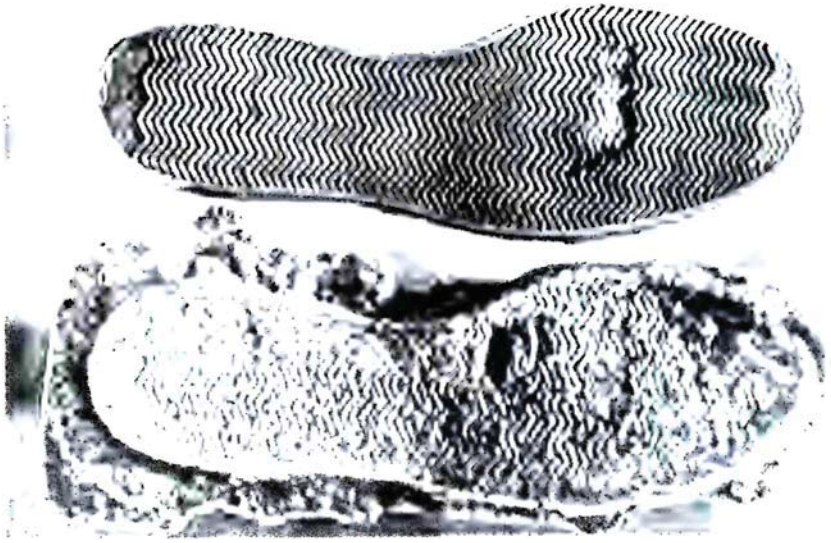


Photo: MRI

The finished cast and the shoe that made the impression.

FIGURE 31 (Concluded)

Metal casting frames are then set up around the impression. There should be at least a 1-inch border between the edge of the impression and the inside of the casting frame. The frame itself should be pressed gently into the surrounding soil. The frame should not bear on a stick or other object that extends into the impression because the resulting cantilever could destroy it. If it appears that the frame would hit such an object, it can be laid on the ground, and a dirt dam built around the outside bottom edge of the frame.

Casting Materials

Plaster of Paris, prepared and applied as discussed here, can be used to make casts of impressions. However, there are other commercial preparations that are coming into use by investigative agencies that provide harder casts and shrink somewhat less in the hardening process than does plaster of Paris. The methods of mixing and applying such preparations are, of course, specific to the product and are not addressed here.

Preparing the Plaster

Plaster hardens quickly. It should not be prepared until after the preliminary steps (silicone spraying and fixing the frame) have been taken.

A rubber mixing bowl should be used because dried plaster will not stick to rubber. However, if such a container is not available, any clean receptacle that is expendable is satisfactory.

First, approximately the amount of water needed to fill the impression is poured into the mixing bowl. Then, the dry plaster is slowly added until the tip of a mound of the compound just breaks the surface of the water. The mixture is stirred thoroughly with a spoon--preferably wooden--until it is about the consistency of pancake batter. If the mixture appears too thin, plaster should be slowly added while stirring to bring it to the desired consistency. Water can be added in the same manner.

Pouring the Plaster

The mixing bowl should be held close to the impression. However, the mixture should never be poured directly on the impression. A baffle, preferably a spoon or spatula, is used to pour against to break the fall of the liquid.

The object in making the initial pour is to fill the impression and to create a stand of plaster about 1/2 inch deep. The plaster is poured continuously from one end of the impression to the other to avoid forming air bubbles.

Reinforcing material should then be added to the cast. The best such material is wire screening, cut in strips about 2 x 4 inches, or less, to fit the size of the cast. Green twigs can also be used but care must be taken to insure a twig does not penetrate the bottom surface of the cast. Dry twigs are unsuitable because in their absorption of moisure they may swell and cause the plaster to crack.

After reinforcing the cast, the mixture should be restirred and the remainder of the plaster added. Depending on the depth of the impression, the finished cast should have an overall thickness of from 1 to 1-1/2 inches.

Special Procedures for Making Casts of Impressions in Snow

Snow is a particularly fragile base for impressions. The chemical reaction between the plaster compound and water create a certain amount of heat, posing the danger that the impressions will be melted away before the casting material can take shape. Although the procedures for preparing impressions in snow are not greatly different from those already discussed, the following special precautions are critical to making a successful cast.

The snow containing the impression should be sprayed four or five times, allowing the silicone preparation to dry each time. Silicone takes about 5 minutes to dry at freezing temperature. After the silicone preparation, a very light coat of dry plaster is sprinkled into the impression. A conventional flour sifter is useful.

When impressions in snow are encountered, it is advisable to make another print in the snow nearby and experiment with the casting. If the snow is near the melting point, casting will be extremely difficult and it may be inadvisable to attempt to cast the real impression.

The plaster compound is mixed according to the procedure already described; however, for use in snow, the preparation should not be poured immediately. It should be allowed to rest for approximately 5 minutes in order to thicken and to dissipate some of the heat generated. It should then be thoroughly stirred once more and slowly poured against a baffle into the impression.

Marking Casts

Before a cast hardens it must be marked, using a knife or other sharp instrument. The following information should be recorded in the plaster:

- Date made.
- Officer's initials (or full name, if practical).

Plaster casts are usually hard enough to remove in about 30 minutes. If it is a thin cast, it should be handled very carefully. After allowing it to dry for about another 30 minutes, the soil clinging to the underside may be removed with a soft bristled brush, but no attempt should be made to thoroughly clean the cast in the field.

The dry cast should be wrapped in clean paper and packaged in a firm container that can be sealed before sending to the laboratory.

Making Casts from Tire Tracks

The general procedures concerning the casting of impressions discussed at the beginning of this chapter apply to casting tire tracks.

Obviously, the vehicle that made the impression would have made three others. Since it is not uncommon for a vehicle to have tires with different tread designs, the investigator must attempt to sort out the impressions corresponding to the vehicle in question from others that may be known to have been made by vehicles having nothing to do with the crime. (At the same time, the possible variety of tread marks and the possibility of relating a mark to a wheel position on the vehicle can provide a high quality of evidence.)

The investigator should include in his notes a description of the tread, the width of the impression, and the distance between impressions believed to have been made by the same vehicle, together with the relative wheel positions, if such can be determined.

If a suspect automobile is found, it is imperative that the crime laboratory experts be called in to examine the tires.

Preserving Soil Adhering to the Finished Cast

Frequently a small amount of soil will adhere to the bottom of the hardened cast. Such soil can represent the best standard available to the laboratory examiner for comparison with other soils taken from a suspect, his clothing, automobile, etc. The cast and the adhering soil should be allowed to dry thoroughly. If the soil still adheres firmly to the cast after drying, the cast should be wrapped in paper and sealed before transporting to the laboratory. Soil that tends to fall away should be packaged separately in a sealed envelope and included with the cast. In no case should the casts's impression surface be vigorously brushed or scrubbed to remove residues. Such cleaning as needs to be done will be accomplished by the laboratory examiner.

Residue Prints

General

Residue prints are foreign materials on a surface. The material may be dust, paint, ink, blood, and so forth. As is the case with latent fingerprints, any friction of the surface may destroy its evidentiary value.

Residue prints, typified by those made by an automobile tire or shoe sole on a light colored surface or piece of paper, are seldom complete; and the degree of detail that is rendered by such a print is usually not high (see Figure 32). However, there are frequently sufficient individual characteristics revealed to allow positive identity to be established. Therefore, even partial residue prints should be recovered.

Photographs of Impressions and Residue Prints

When photographing these prints, the light source is held close to the surface and directed across the image so that a maximum contrast may be achieved. If the light is flashed directly at the print, contrast is usually "washed out" and the picture may be of little or no value.

One photograph is seldom enough to record all details of an impression or residue print. At least two photographs should be taken, the light being moved about 90 degrees for the second shot.

Investigators who use the 4 x 5 inch speed graphic type camera should note the following procedures in photographing impressions. Place the camera (mounted on the tripod), directly over the impression. This will prevent foreshortening. A scale should be included in the photographic field. Photographs of impressions should always be taken with the camera mounted on the tripod, and using the ground glass to focus. Shoe impressions are seldom found on absolutely flat surfaces. Using the ground glass in this way makes it possible to set the camera so that the film will be parallel to the surface being photographed.

Lifting a Residue Print

After recording and photographing a print, an attempt may be made to lift and transfer it to a surface that can be sent to the laboratory. Obviously, if it is possible to remove the original surface on which the print rests, this is the preferable procedure.

The residue print may be one of two types. The first type is made on a dusty or otherwise contaminated surface. The impression is formed by removal of some of the dust by contact with some object or with the treads of a shoe, or tire. The second type is made by foreign material having been deposited on a surface, such as a clean table top.

RESIDUE TIRE PRINT

Photo: KCPD

The degree of detail in this print can be considered as optimal for all those of its type.

FIGURE 32

In most cases, fingerprint tape can be used to lift a residue print. One strip is pressed over the print starting at one edge. A second strip, if needed, is then placed along the first, overlapping about 1/4 inch. The procedure is repeated until the entire surface of the print has been covered. Some additional tape strips may be placed across the top of these to add reinforcement while the print is being lifted.

However, before the print is actually lifted, the surface to which it is to be transferred must be prepared. The transfer surface should obviously be large enough to take the entire print and allow some border. The color of the transfer surface should be as near like that from which the print is taken as possible. However, if the material composing the print is white insulation dust from a safe, black is the best background. If the print is composed mostly of dust, white is the best background.

Importance of Cuts and Other Unusual Marks in Residue Prints

Because of the relative low level of detail and resolution that most residue prints offer, compared to latent fingerprints and tool marks, it is important to pay particular attention to any mark, cut, gouge, or unusual brand marking that gives the print an unusual character.

The wear pattern in a shoe sole or tire tread is useful in establishing a class characteristic, but is seldom sufficient to establish individual identity. Similarly, the outline of the print and its configuration is useful in determining the size, shape, and brand characteristic of a shoe or tire, rather than determining that the print was made by a particular tire. However, there is a very low probability that an identical cut or gouge in the sole of a shoe would occur to the same extent, shape, length, and angle in more than one shoe. Therefore, such identifying characteristics must be carefully preserved in the processing of residue prints.

Preparing Standards of Residue Prints

If shoe, tire, or other residue prints have been collected from the crime scene, it will be necessary to collect standard prints from any suspects arrested or from vehicles suspected to have been driven onto the scene. The investigator should prepare shoe print standards only when the shoes from the suspect cannot be sent to the laboratory.

There are two ways that shoe print standards may be taken for this purpose.

- The bottom of the shoe sole may be lightly rolled with fingerprint ink, and the suspect asked to walk on a length of white paper until most of the ink has been deposited.
- As an alternative, the investigator may prepare the standard himself, by pressing the shoe onto the paper.

Standard prints of residue tire tracks are best collected where a hydraulic lift is available to raise the front or back of the automobile. The tire treads are then lightly rolled with fingerprint ink, and the wheels lowered onto a strip of paper. The car should be pushed or driven forward one complete revolution of the wheels--and no more. The procedure can be repeated with the other two wheels, if desired. The position of the tires on the vehicle (right front, left rear, etc.), should be noted on the prints. The paper on which the print was taken should be rolled into a cylinder, not creased.

Casting Tool Marks

Tool marks which are not sent to the laboratory should be cast. Figure 33 illustrates the procedure for making such casts. Silicone rubber and a catalyst are mixed just before use and quickly applied. Plaster of Paris, molding clay and other materials are not suitable for casting tool marks because they tend to shrink or expand when they set up and are usually too coarse to reproduce the microscopic detail of the mark.

Casts of tool marks should be prepared only when there is no other practical way to preserve the mark for court. When casts are made they may be marked by tying a knot in the string of an evidence tag and embedding the knot in the cast before it has set up. The identifying information is then written on the tag. Casts may also be identified by placing them in a sealed container which is marked on the outside. Either method is acceptable, but the first is best from the standpoint of legal requirements.

It is often desirable to place an orientation mark or marks in the soft silastic to aid the crime laboratory examiner to orient the cast in relation to the object from which is was taken. Small arrows can be used, for example, to indicate the "up" end of a cast in relation to the base object, such as a door facing, or lock face plate.

TECHNIQUE FOR CASTING TOOL MARKS

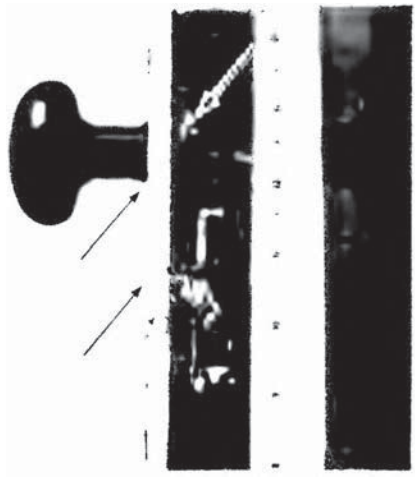


Photo: MRI

Marks in both the wood of the door and the lock face plate are discernible.

Photo: MRI

Silastic material is applied to the mark in wood using a spatula.

Photo: MRI

Before the silastic hardens the string of an identification tag is imbedded in it.

Photo: MRI

The dried cast is removed. Note the detail of the impression retained.

FIGURE 33

Photo: MRI

A separate silastic cast made of the tool mark in the lock face plate.

FIGURE 33 (Concluded)

CHAPTER XIV

PAINT AND GLASS

INTRODUCTION

Paint and glass are forms of physical evidence that are very frequently encountered. The paint chips or samples and glass fragments collected are often in very small quantities or sizes--and therefore qualify as trace materials. However, the wide scope of evidence that paint and glass materials offer and their importance to a variety of cases make it appropriate to consider them separately.

Paint

Paint, in any form, can be useful clue material in an investigation. It may be a chip from a dried paint surface, a fresh paint smear, or intact on some object. Paint as physical evidence is perhaps most frequently involved in burglary and hit-and-run cases.

Whenever an attempt is made to force entry to a building, some type of instrument is likely to be used. If the object being forced is painted, chips of that paint may cling to the instrument and may also fall on the clothing of the suspect. At the same time, if the instrument being used is painted, some of the paint may be transferred to the object forced. Transfers of paint chips or traces are equally probable in automobile collisions. The capability of a criminalistics laboratory to do paint analyses, augmented by an automotive paint file that it maintains, can often provide valuable investigative leads toward identification of the year, make, and color of a motor vehicle, working from a small chip of paint left at the scene.

Examination of Paint

Paint is usually examined comparatively--a sample recovered from a search is compared to a known standard of paint. Paint chips may also be examined for a physical match with a part of a painted surface, attempting to match up the broken edges, scratches, or blemishes in the larger surface to any that may be discernible on the samples collected. Physical matching also involves making comparisons between texture, coloring, discolorations, layering, and other characteristics that may help to establish the identity or source of the sample. The crime laboratory can also perform certain chemical examinations of paint samples. A chemical analysis can only prove similarity or dissimilarity.

Seldom will the chemical analysis (destructive type) prove a common source. The purpose of these tests is to identify the type of pigment and filler used in the manufacture of the paint.

In order for the laboratory to make a comparison, standards or samples of paint that have a known origin must be taken. When samples are collected from any painted surface, the paint should be chipped rather than scraped off. If paint is scraped, its layer structure is altered and important potential points of identification are lost. The paint standards should be taken from two sources: one from within any area damaged in the commission of an offense; and the other from an adjacent undamaged area. There is an important exception to this procedure, however. If the damaged area is a tool mark, no paint sample is taken from within it for the obvious reason that the mark would be altered. Only a sample from the adjacent undamaged area would be taken in such cases. In hit-and-run investigations it is particularly important that the standards from the undamaged painted area of an automobile be taken from the areas immediately adjacent to the point or points of impact; but, not from an area in which the paint is corroded (or at least exceptionally corroded relative to the general condition of the surface). Each paint sample should be separately packaged and marked to indicate the exact location of its recovery.

Standards of oxidizing (chalking) paint are best taken by removing several square inches of the painted surface or taking the entire item, if that is practical.

Collection of Paint for Examination

Paint as evidence may be collected in one of the following forms:

- Small flakes or chips.
- Traces of oxidized ("chalking") paint.
- Smears from fresh paint.
- An intact painted surface or item.

Of these, paint chips are generally of the highest evidentiary value, primarily because they are more likely to be overlooked by an offender attempting to rid his person or possessions of traces that could link him with the crime. However, this is not to downgrade the generally high value of paint as evidence, regardless of its form.

As already noted, paint chips are most likely to result from an attempt to force something, or as a result of any violent contact between objects--one of which has a painted surface. Paint chips should be collected very carefully to keep them intact. The larger the chip the higher its value as evidence. Chips may be picked up with tweezers; however, a preferable method is to scoop them up with a piece of paper.

Gummed tape should not be used to recover paint samples. When removing the tape from the surface the chip may be damaged. Envelopes should not be used as a container for paint samples. However, if an envelope must be used, the material should first be wrapped in a piece of clean paper.

Standard samples taken from two different areas should not be put in the same container. Each sample should be maintained in separate containers, even if from the same object. An example of this would be a hit-and-run auto with damage to both the front and rear fender. The sample from each fender should be placed in a separate container.

A good way to collect a standard paint sample is to tape a piece of clean paper below the area where the sample is to be collected, then chip the paint into the paper. The paper is removed, folded so that the sample will not leak out, and sealed into a suitable container. This sample should be marked as a standard and the exact location of its recovery should be noted with the other identifying data required.

Glass

Glass can be of relatively high value as evidence because of the identifiable variations in its physical properties and methods of its manufacture. The evidence value of glass is also enhanced by the fact that fragments may frequently be physically matched.

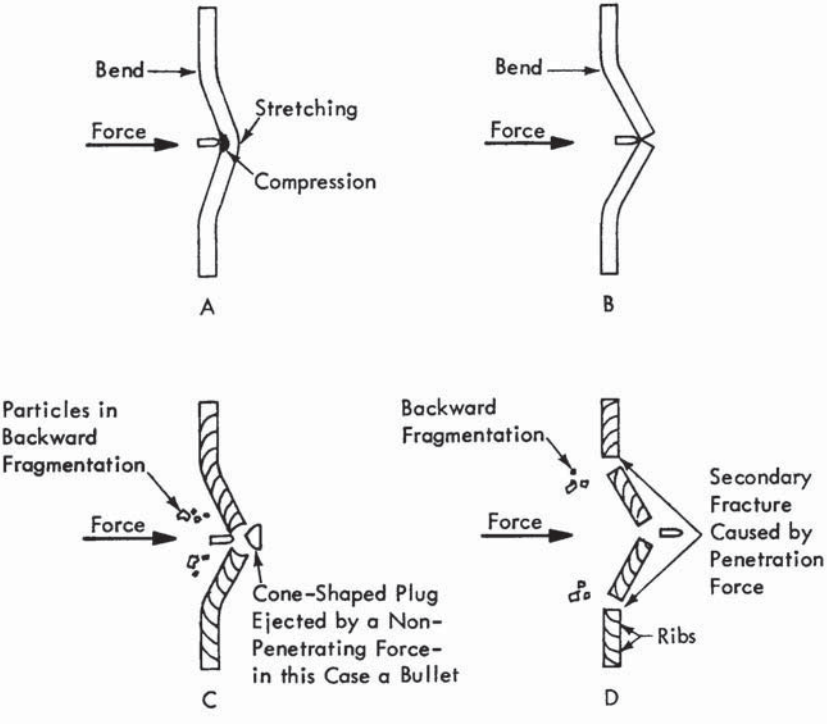
Glass Fragmentation

It is useful for the investigator to consider the various ways in which glass fragments were subjected to force. The strength of any glass plate or object lies primarily in its surface. Once the surface is damaged, the remainder of the material is easily cracked or fragmented. Although glass is a very brittle substance, it does have a small amount of elasticity, and can bend slightly away from a point of force, as Figure 34 shows. However, if sufficient force is continued, radiating cracks will appear in the material. If the force exerted by a projectile (such as a "BB") does not penetrate, it usually causes the dislodgment of a cone-shaped fragment on the side of a pane of glass that is opposite to the one to which force is applied (Figure 34). At the same time, there is some backward fragmentation, causing very small slivers of glass to be thrown in the opposite direction from which the force was applied. Often the practical effect of this is to cause small traces of glass to be lodged in the hair or clothing of an individual who strikes a pane of glass with an object.

If the force is sufficient to penetrate the glass, cracks will first radiate more or less in a star shape from the cone, secondary fractures will occur, and fragments will be thrown in the direction of the force. Some backward fragmentation will, of course, occur.

The radial fractures in a pane of glass and the spiral concentric fractures tend to create pie-shaped fragments, the narrow end of the fragment being the one closest to the point at which the force was applied.

TYPICAL GLASS FRAGMENTATION PATTERNS



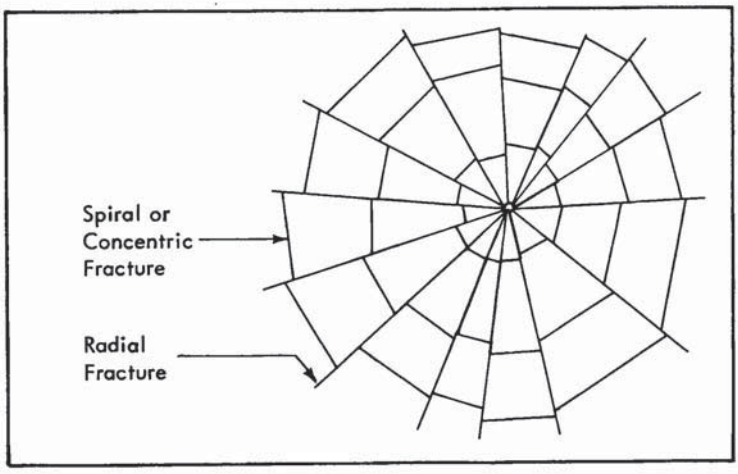


FIGURE 34

Fragment Examination

An exact fit of a piece of broken glass with the broken edge of another piece usually is conclusive evidence of the source of the fragment. But in order for an edge match to be conclusive, the fragment must be large enough to allow a "fit" and the thickness, color, variation, "grain," and general appearance of the fragment must be the same as the piece to which it is being matched. The need for physical matching most frequently arises in hit-and-run cases, where headlights or other glass lenses have been broken in the collision.

Glass Identity From Physical Properties

If the glass fragment is too small to allow an edge match, the crime laboratory may examine the physical properties of the fragments. The density, refractive index, and light dispersion characteristics may be used to make the comparison.

Collecting Fragments When Direction of Force is in Question

If the investigator desires an answer to this question, all of the glass fragments apparently pertinent to the crime should be collected and forwarded to the laboratory. If a window is broken in the commission of the crime, the investigator should submit, in separate packages, glass found outside and inside the building, and glass taken from the window frame. The surfaces of the fragments should be marked showing whether they faced outside or inside when they were intact in the window.

When Direction of Force is Not a Question

If the direction of force used to break the glass is immaterial, a sample of glass from each broken object is sufficient for evidence gathering. If two panes of glass were broken for example, a sample from each should be collected. Glass from each different location should be placed in different containers. Standard glass should always be taken from any remaining glass in the window or door frame, as close as possible to the point of breakage. Standards should be taken from the ground only when there is no glass remaining in the frame. In such an event, care should be taken not to collect obviously extraneous glass as a sample.

Search of a Suspect

If a suspect is arrested at the scene of a crime or within a reasonable time after its commission, his clothing and person should be thoroughly searched for glass fragments.

CHAPTER XV

QUESTIONED DOCUMENTS

INTRODUCTION

The term questioned documents is used here to include altered, forged, or otherwise suspect documents. A document may be the sole basis for an investigation, such as a forged check, or it may be the prime evidence in another case, such as a murder or kidnapping.

When a questioned document comes to the attention of the investigator, he should take steps at once to protect it from damage, contamination, or alteration. The document should be placed in a transparent container as soon as it is received, taking care not to add folds.

PRELIMINARY EXAMINATION

Documents may be examined from the standpoint of identifying physical characteristics (type paper, marks, and indentations), chemical properties (quality of paper, inks used), or handwriting (and thereby, the author). However, the investigator should limit himself to only the physical examination, focusing attention on color of inks or pencils used, the type of paper, and handwriting. Evidence of erasures or other apparent alterations of what appeared to be the original document are of particular interest when quantities of goods and money are involved.

The type of writing instrument (apparently) used and the physical characteristics of the paper should be given close attention. The paper's overall quality, color, texture, weight, and the presence of watermarks are useful characteristics to include in the investigator's case report. Such characteristics may identify a special manufacturing process or a particular supplier or purchaser, or they may be used for comparison with standards collected during the investigation.

ALTERATIONS

An alteration of a document is the writing over of previous writing. Common examples of alterations include changing a one to a seven or adding one or more zeros to an amount that has been expressed numerically.

- An obliteration is the intentional destruction of some part of an original writing by marking through or over it. If this is done with the same material as was used to write the original material, recovery of the writing is difficult, if not impossible.

- Erasures on documents may be accomplished by either chemically or mechanically removing marks on the paper. Chemical erasures are used most often on documents written with ink. The chemical does not remove the ink, but renders it colorless. Mechanical erasures remove the written material and disturb the fibers of the paper. When the writing is thoroughly removed with a mechanical eraser, it may be impossible to determine what was written originally, although the erasure may be quite evident.

The discovery of a torn document or a fragment of a document during an investigation should spark an attempt to find all of the remaining pieces. The laboratory will first chemically process the document fragments for latent prints and then attempt to restructure them.

If a document fragment has been partially or completely burned, it should be handled with the greatest care because of its brittle character. If the ash is not distrubed, it may still be possible to read writing on it and to reconstitute all or part of the document by physical and chemical means. If the ash is discovered in a container which can be transported, the container should be covered and then carefully removed to the laboratory, making no attempt to remove the contents. If the material is in an area that cannot be transported (such as a fireplace), the investigator should carefully slide a board or other thin, firm material under the ash and place that board in a cardboard box for transport to the laboratory. Figures 35 and 36 illustrate these points.

The investigator should be alert for indented writing left on a paper pad after a top sheet has been removed. Writing of this type can be read by passing light over the paper at a very low angle. The indentions which receive less light than the original writing will appear as shadows and likely be discernible. Carbon paper, particularly relatively new sheets, may often reveal similar information, although no special lighting is required.

MECHANICAL WRITING DEVICES

The most common mechanical writing devices the investigator will encounter are typewriters, check protectors, adding machines, cash registers, and rubber stamps. An attempt should be made to establish the make and model of the instrument used to print a suspect document, or to find the particular machine used to generate it. The investigator may be able to develop significant leads in his work through the various factors or conditions which serve to individualize any mechanical writing instrument.

EXAMPLE OF IMAGE RETENTION ON FRAGMENT OF PAPER ASH

Photo: MRI

A high degree of detail can sometimes be retained in paper ash, as this example shows. Compare the clarity of the horseman on the ash and the intact check.

FIGURE 35

PROPER METHOD OF COLLECTING PAPER ASH

Photo: MRI

Here, a fragment of ash is collected by carefully sliding a piece of stiff paper under it. The paper and ash is then placed in a cardboard box that will not put pressure on the fragment at any point.

FIGURE 36

A slight variation, such as an off center key built into a typewriter at the time of manufacture, may later serve as a valuable means of individualizing a machine. Every writing instrument is subject to normal wear, damage from improper use, and accumulation of debris on the type face. The resulting variations in printing may prove valuable in identifying a particular instrument. In some cases, dirty type faces may be useful in dating a document that was written on the instrument, if machine maintenance records are available.

DOCUMENT STANDARDS

Standards (samples of documents of known authorship or origin) are critically important to the expert examiner. In many cases, without both the document in question and a standard of reference, the laboratory examiner is limited as to the number of analyses he can perform. For example, a fragmented page of a telephone directory found in the possession of a suspect is not incriminating in itself. But if the fragment can be matched with a page of a directory found at the crime scene, the evidence takes on dramatically increased significance.

Analysis of the paper in a sample and a standard may determine that the composition of the paper is identical, thus providing a missing link in the case. Paper standards can also provide information used to identify the manufacturer of the paper and watermarks can establish that the paper in the questioned document and the standard were manufactured at the same time. The expert examiner can also determine if an indented impression appearing in a standard was made by the writing on the original questioned document. Thus, he can establish that the standard was underneath the original document at the time it was written. He can also ascertain whether the standard and sample have undergone similar stress or strain pressures, indicating that they were close at some time. A primary purpose of document comparison is to identify alterations of original documents, whether accomplished by mechanical or chemical means. Documents which are frequently altered include checks, receipts, affidavits, discharge papers, etc. Whenever a paper standard is available for submission with a questioned document (such as a blank check with a suspected forged check), both should be sent to the laboratory. Alterations of original documents are much easier to observe if a standard is available for reference.

Handwriting comparisons of a document with a standard may determine whether the document was written by one or by several persons, that a signature on a document is genuine, or that additions or deletions were made after an original was made.

Typewriter material comparisons can identify changes in document context made by a different typewriter, inconsistencies in the date of manufacture of a typewriter and the date of the document, the common origin of two or more documents (same machine used), or the specific typewriter used in preparing a particular document.

Collection of Document Standards

Following are the general requirements of the crime laboratory for document standards. However, if the standard is not available, the investigator should still submit a document for examination.

- An envelope that apparently "matches" the stationery on which a suspect document was prepared.
- The tablet from which a sheet of paper in question may have been torn.
- A blotter that may have been under the questioned document.
- A sample of a similar type paper of known age, if the age of the suspect document is important.
- The pen suspected to have been used to write the material in question.
- Pencils of the same lead type as believed used in writing on the questioned document.
- Material written in the hand of a suspect. (Comparisons are then conducted between writings of known authorship (the standard) and documents submitted in the case.)
- Typewriter standards.
    - Collected for the purpose of determining whether a questioned document was written on a particular machine.
    - Typewriter standards may be collected during an investigation or the typewriter may be submitted to the laboratory. If the investigator does not choose to submit the typewriter as evidence, he may obtain the typewriter standards himself.
    - The document in question should be reproduced on the standard typewriter unless it is excessively lengthy, in which case, only the first paragraph need be reproduced.
    - In addition to typing the content of the questioned material, each character on the typewriter should be reproduced, both in shift and nonshift positions with a space between each.
    - A separate sheet of paper should be used for each standard (if more than one machine is involved).

- The same relative intensity used in typing the questioned document should be used in preparing the standard.

- The name of the person making the standard, the date and place it was made, the manufacturer of the machine, and serial and model number should be typed on the front of each sheet.

Handwriting Identification and Handwriting Samples

This section deals briefly with the factors that affect the acquisition of handwriting skill and characteristics, and with the proper means of collecting handwriting standards.

The child learns to write by attempting to draw a character that will match a standard he is given. However, that initial handwriting skill is soon increased and changed as he matures and acquires experience in the nerve-muscle responses that are involved. These responses become habitual and his writing becomes more an automatic process to him, taking on highly individual aspects.

There are some who theorize that personality manifests itself in the subject's handwriting. However, there is sharp disagreement among experts as to just how personality may affect this process. In any event, it is certain that such factors as the pressures of business, the way a person consistently uses his hands, a conscious attempt at "style" (such as deliberate rearward slanting of the characters), muscular development, and physical disabilities can cause an individual's handwriting to change. Such change is usually a slow process; however, most individuals exhibit sufficiently consistent character formation, spacing, slant, and pressure characteristics to make it probable that their writing can be identified by an expert.

The police investigator collecting a sample of handwriting from a subject should be aware of the several possibilities of introducing variables that could significantly alter the usual style of the subject's writing. The more important of these are:

- Shock or fear. If the individual is badly shaken, as a suspect in a criminal investigation or a victim of recent criminal action may easily be, a quaver or other characteristic may show in the standard that is abnormal to the individual's style.

- Unfamiliar writing materials. Generally, those furnished for writing the standard should be as alike as possible to those apparently used in writing the questioned document. An individual unaccustomed to a fluid type fountain pen, as are many Americans today, may write somewhat different with such a pen, than with the more familiar ball point. The way the paper is ruled, or the fact that it is unruled may also affect the handwriting of persons who have become particularly accustomed to one type or the other.

- Unfamiliar physical position or adverse conditions. The subject should be allowed to sit down and be comfortable to write the standard. He should not be made to write on an irregular surface, under poor lighting, around loud noises or other obvious distractions. If there is some reason to suspect that the questioned document was written in some particular way such as standing, using a clip board, it may be advisable to take an additonal standard written under those same conditions.

- Writing without glasses that are normally worn. The point needs no amplification. However, it is one for the investigator to check before taking a handwriting sample.

- Taking an insufficient sample. It is always good practice to have the subject write several full pages. The subject matter is not particularly important, however, there should be provision to have him repeat the same words or characters that are in question. There is danger, in taking a short, specific-type standard, that the subject will successfully alter his handwriting, or be so nervous or distraught during the writing that it will not be representative. Writing a several page sample will offer opportunity for him to unconsciously relax any deception he may be attempting, or simply to calm down.

As opposed to requested exemplars, constituting handwritten samples written by the subject with knowledge that the sample will be used in a police investigation, nonrequested samples can, and should, be sought from a variety of sources, such as those listed in Table 3.

Nonrequested exemplars offers two principal advantages. The first is that the writing is almost certain to be free of any concious attempt at disguise or distortion by the subject. Such attempts must always be considered a possibility when taking requested examples. The second advantage is that nonrequested examples can often be found that date comparably to the time of the incident or offense under investigation which involved the suspect's writing. For example, a note figuring in the investigation of a homicide occurring 3 years previous could possibly be matched to a business letter handwritten by the suspect dated about the same time, together with canceled checks and other documents. Although handwriting styles normally undergo comparatively slow change, the ability to make both a style and temporal comparison of a subject's handwriting adds powerfully to any conclusions reached concerning identity.

The investigator should record and report to the expert who will examine the questioned document and the standard, the conditions under which a handwriting sample was taken. The apparent state of mind of the subject is also of interest in this regard.

TABLE 3

WHERE TO FIND HANDWRITING SAMPLE

Sources of Genuine Writings

1. City Records
   - Building Department permits
   - City Auditor: canceled checks
   - City Clerk: licenses (peddler, tavern, special permits, etc.); voters registration lists
   - Personnel Department: Civil Service applications
2. County Records
   - County Clerk: Civil service applications, claims for services or merchandise, fishing, hunting, marriage licenses
   - Department of Taxation: State income tax returns
   - Purchasing Department: bids and contracts
   - Register of Deeds: deeds; birth certificates, public assistance applications, ID card applications
   - Selective Service (local board): registrations appeals
   - Treasurer: canceled checks
3. Department Store Records
   - Complaints and correspondence
   - Credit applications
   - Receipts for merchandise
   - Signed sales checks
4. Drug Store Records
   - Register for exempt narcotics, poisons
5. Education Documents
   - Applications for entrance
   - Athletic contests
   - Daily assignments
   - Examination and research papers
   - Fraternity and sorority records
   - Receipt for school supplies (laboratory, athletic gear)
   - Registration cards and forms
   - Federal and State Loan and Grant applications
6. Federal Records
   - Customs documents: immigration and naturalization records
   - Department of Justice (FBI): fingerprint cards, National fradulent check file, checkwriter standards file, safety paper standards file, rubber stamp and printing standards file, typewriter standards file
   - Military records
   - Patent office applications
   - Post Office Department: P.O. box application, registered and special delivery receipts
   - Social Security Administration: applications for numbers, benefits
   - U.S. Treasury: canceled payroll checks
   - Veterans Administration: application for benefits (veterans and widows)
7. Financial Documents
   - Canceled bank checks
   - Contracts and related correspondence
   - Credit applications, for example, to a department store
   - Deeds
   - Deposit slips
   - Expense accounts
   - Insurance documents including health and accident
   - Lease agreements
   - Loan companies records
   - Microfilm bank records
   - Pension applications and checks
   - Promissory notes
   - Safety deposit vault register and applications: bankruptcy proceedings, cash received slips, withdrawal slips
   - Title companies documents
8. Hospital Records
   - Admissions releases
9. Library Records
   - Applications for cards
10. Miscellaneous Documents
    - Administrator, estate
    - Airplane logs
    - Answers to decoy letters
    - Architects plans
    - Asylums
    - Auctions
    - Bail Bonds
    - Building after hour registers
    - Close associates
    - Complaint bureaus generally
    - Copyright applications
    - Death certificates
    - Decoys, deliver receipts, return receipts for registered mail
    - Exchanges
    - Express company, cartage, mover's receipts
    - Express records and receipts
    - Furniture contracts
    - Guardian
    - Janitors (wastepaper)
    - Legal papers, generally
    - Messengers receipts
    - Neighbors
    - Newspaper reporters
    - Notaries
    - Office boys
    - Partners
    - Permit to open mail
    - Railroad passes
    - Rent receipts to tenants
11. Military Documents
    - Bases and stations: National Guard, Army, Air Force, Navy, Coast Guard, Marines
    - General service related papers: tax exemption filings and loan, real estate, pension, medical educational
    - Record depots (for ex-service men)
    - Selective Service (draft board) records
12. Motor Vehicle Documents
    - Applications for registration
    - Court documents relating to accidents
    - Credit card applications and invoices based thereon
    - Hotel and motel registrations and reservations based upon routes of travel, as gleaned from credit purchases
    - Installment contracts on vehicle purchases
    - Insurance papers
    - Operator's and chauffeur's licenses and applications therefor
    - Orders for service
    - Reports of accidents
    - Report of loss or theft
13. On the Person
    - Contents of wallet (signed ID cards of all types, and photographs)
    - Letters, postcards
    - Notebooks
    - Possport

TABLE 3 (Concluded)

14. Personal Documents
- Autograph albums
- Automobile repair work order receipts
- Back of photographs
- Bank account books
- Birth and baptismal certificates and records
- Book contracts
- Books in general (flyleaf signatures)
- Canceled checks
- Check stubs
- Correspondence and postcards
- Diaries
- Family Bible
- Greeting cards
- Hospital and medical records
- Insurance policies
- Labeling on cans, bottles, etc. (kitchen, workshop)
- Marriage documents
- Memoranda about home and office such as a note to milkman, etc.
- Military service records
- Pages of photograph albums
- Passports
- Personal notebooks
- Prescriptions
- Rent receipts (receipts in general, i.e., movers, credit)
- School yearbooks
- Telephone and correspondence listings
- Wills

15. Police Sheriff's Department Records and General Criminal Documents
- Arrest Records (including fingerprint cards)
- Complaints and reports to police departments, sheriffs, district attorneys, etc.
- Court of Claims
- Court clerks
- Exemplars obtained incident to booking procedures
- Jail and penitentiary records
- Jury Records
- Juvenile court
- Parole and probation reports
- Receipts for returned property
- Writings obtained by other agencies in prior investigations
- Writings obtained by your own agency in prior investigations

16. Public Utility Records (Corporate Documents)
- Applications for service: cable television, electricity, garbage, gas, telephone, water
- Books of account
- Invoices
- Minutes
- Original telegram messages
- Reports to intra and interstate and commerce agencies

17. Real Estate Records
- Property listing agreements

18. Relatives
- Letters and cards of all types

19. Social, Recreational, Fraternal Documents
- Documents relating to: civic organizations, clubs (luncheon, sports, etc.), loges, nonprofit groups, political groups, PTA organizations, religious organizations

20. State Records
- Conservation files: boat, fishing, hunting licenses
- Corrections files: probation and parole reports
- Incorporation documents (those filed with state agencies)
- Motor vehicle files: drivers files, title files
- Personnel files: Civil Service applications and examinations
- Secretary of State: applications for notary public
- State Treasurer: canceled checks
- Taxation files: beverage and cigarette tax applications

21. Vocational Documents
- Account books
- Applications for employment
- Applications for professional and vocational licenses
- Canceled payroll checks
- Civil Service papers
- Clients checks
- Credit Union paperwork
- Employment bureau and personnel office papers
- Labor union documents
- Order blanks
- Professional rolls
- Public examinations (Civil Service, etc.)
- Receipt books
- Receipted bills
- Receipts for pay
- Reports and surveys
- Secretary
- Stenographic and clerical memoranda
- Time cards
- Vacation and petty cash requests
- Withholding exemption forms

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CHAPTER XVI

IDENTIFICATION OF THE UNKNOWN DEAD

INTRODUCTION

Much information relating to the identification of a cadaver can be obtained by a detailed examination of the remains together with any clothing and personal effects on the body. The procedure described here for identification of the unknown dead represents a checklist of identification points which, when used with other facts in the case, may lead to positive identification.

Identifying the unknown dead may well be one of the most difficult and distasteful tasks that an investigator may be called upon to undertake, particularly if the body is badly burned or decomposed. Because of the distateful nature of such investigations, important facts are often overlooked.

Establishing the identity of the victim is as important as establishing the identity of the suspect. The conditon of the body, in many cases, is the limiting factor in what can be done. The investigator may require help from the crime laboratory expert and the medical examiner.

Examination of Clothing

Any clothing on or near the victim should be examined carefully, particularly if the body is swollen or so badly decomposed that the size of the victim cannot be readily determined from an examination of the body alone. The written record of the examination should reflect the color, type, size, and any unusual conditions of the victim's garments, store labels, laundry markings, the condition of buttons, and the presence of trace materials on a garment. Clothing items that have been removed from the victim should be laid out on clean pieces of paper and allowed to dry (if wet) before they are wrapped and sent to the laboratory.

Personal Effects Examination

The personal property items on or in the vicinity of the body should be examined for information that would lead to the place they were acquired. Personal items may also contain a name or address. Personal effects which may provide useful clues include:

- Driver's license
- Social Security card
- Identification card
- Identification tag
- Photographs
- Letters or other notes
- Check stubs or invoices
- Rings
- Smoking materials
- Car and house keys
- Miniature license plates on key ring
- Monogrammed wallet or case
- Watch (engravings and repair marks)
- Eyeglasses (conventional, contact lenses, artificial eye,
- Hearing aids

Visual, External Examination of Body

After the clothing has been removed, the investigator should write into his notes a complete description of the body. The description should include:

- The victim's sex, approximate age, height, and weight.
- Muscular build (well-developed, obese, slight, etc.).
- Color of eyes.
- Race.
- Skin condition (complexion, evidence of disease, scars, or needle punctures).
- Hair (quantity, color, natural or wig, style).
- Teeth (natural or false, obvious dental work).
- Fingernails (length and condition, discoloration, presence of foreign materials under nails).
- Any amputation or deformities apparent from an external examination of the body.

The investigator should also look for evidence of any occupational trademark of the victim, such as worn finger ridges characteristic of bricklayers, or uncalloused hands associated with white collar workers. If friction ridges are present on the fingers, a set of prints should be made (however, this is best accomplished in the morgue).

The body should be photographed at the crime scene. Shots should be taken of the entire body and of the head alone (full face and profile).

Other Suggested Procedures

When only bones or skeletal remains are discovered, the investigator should photograph and record their relationship with each other before disturbing them. Any foreign material which may adhere to the remains should not be removed because it may contain trace evidence.

If it is still possible, the investigator should arrange for a blood sample to be taken for examination by the crime laboratory, even though an examination will be made by the pathologist. If a blood sample cannot be obtained from the cadaver, tissue samples should be taken.

It is advisable to arrange for X-rays of the entire body of the victim. Bone fractures and hidden deformities may be disclosed which will help in identification.

Internal Examination of the Body

Internal examination of the body is accomplished by a licensed pathologist and never by the crime scene investigator. Such examinations are intended both to establish the cause of death and to aid in the identification of the victim.

APPENDIX A

HOW TO COLLECT, MARK, PRESERVE, AND PACK PHYSICAL EVIDENCE

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Arson or Fire Bomb 1. Liquid	Leave in original container. Check for latent prints. Remove liquid from original container. Check container for latent prints.	Place a label on the outside of container indicating the place where specimen was taken, date, time, complaint number, and name of submitting officer.	Up to 4-ounces. No standard needed.	Place in 4-ounce metal container and seal securely. To insure chain of custody, place a seal of masking tape or packaging tape over top and have submitting officer sign.	Used to determine the properties and the fluid, which may be utilized as investigative leads.
2. Non-Liquid, i.e., ashes and debris taken from point of origin and all mechanical or electrical devices which may have been used to ignite the fire.	Use tweezers for small particles. Handle with extreme care. Use piece of stiff paper to slide under ash.	Same as above.	All of specimen. No standard needed.	Place the specimen in a clean and dry container. Handle as carefully as possible to keep specimen intact.	Used to determine the elements utilized to create the fire, thereby possibly finding a modus operandi.
Blood 1. Liquid Known samples	For a summary on the technique for handling blood samples, see Chapter VII.	Use adhesive tape outside of test tube. Name of donor, date taken, doctor's name, name or initials of submitting officer and complaint number.	5 cc. in sterile test tube. No standard needed.	Sterile test tube only. No preservation for grouping tests. Wrap in cotton or soft paper.	Used to determine blood group and content of alcohol in blood.
Questioned samples	Same as above.	Same as above.	Up to 5 cc. No standard needed.	Collect by using eyedropper or clean spoon. When possible use a clean test tube, otherwise transfer blood to a non-porous surface (glass). Allow to dry and submit in pill box which can be sealed.	Used to determine blood group and nature of blood. (Whether human or animal.)
Clothing (Contaminated)	Care must be taken not to loosen any trace materials from the garment.	Use string tag and label. All pertinent data shall be furnished.	All clothing. No standard needed.	Pack only when dry. Do not cut through contaminated portion of clothes. Each article will be wrapped individually in a clean dry evidence bag. Information relative to the offense shall be included on the evidence bag.	Used to determine what the contamination is, e.g., blood, powder burns, semen, etc., and what it indicates.

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Documents (Letters, notes checks, etc.)	Use tweezers. Do not place tweezers over any obvious smudge. Protect for latent prints.	Place initial and date on outside of the sealed envelope or other container used to package the document. Do not mark on document.	All documents. No standard needed.	Document should be handled, folded and marked as little as possible. If folding cannot avoided the fold should be along old lines. Place in proper enclosure envelope and seal with transparent tape. Flap side of envelope should contain title of case, description of contents, complaint number and submitting officer's name.	Used to determine possible identity of authorship and to check for fingerprints, alteration, erasure or forgery.
Fibers	Fibers are usually obtained through vacuum sweepings with a special filter attachment.	Label outside of sealed container.	All fibers. Original garment or cloth, if possible.	Pack in folded paper and place in envelope or pill box. Seal tightly to prevent loss.	Used to compare fiber at scene with suspect material.
Fingerprints 1. Latent Lifts	For a summary on the technique for handling latent lifts, see Chapter VI.	On the back of the card to which the prints are transferred. All pertinent information shall be furnished.	All latent prints. The names of all officers at the scene and elimination prints of all people who have legal access to the area or object in question.	The print shall be transferred from the object to a non-porous card. The card shall be sealed into a fingerprint envelope.	Used to determine positively who was at the scene.
2. Paper for chemical processing	Paper should be handled as little as possible. Do not fold, and roll only when absolutely necessary. Use tweezers if possible.	Same as above.	Same as above.	Same as Documents.	Used to determine if latent prints are present.
Firearms 1. Handgun	Handle only by the knurled portion of the handgrips, until processed for fingerprints.	Scratch initials or marks of identification in an inconspicuous place on the frame. Do not mark with an "X." Do not mark on parts of weapon that can be easily removed. If loaded or fired shells in revolver, mark positions. It should be noted that marking the firearm in an inconspicuous place is best.	All. No standard needed.	Attach string tag with pertinent information included on it. Place in heavy paper envelope.	Used to determine if weapon was fired or for firearms identification.

APPENDIX A (Continued)

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Firearms (Cont.)					
2. Rifle/Shotgun	Handle by the trigger guard edge and the serrated parts of the stock and forepiece as purchase points.	Same as above.	All. No standard needed.	Attach string tag with pertinent information included.	Same as above.
Ammunition					
1. Bullets fired	Use tweezers with taped ends. Avoid damage to rifling marks on the circumference.	Mark with initials either on base or nose of bullet. Do not mark on sides.	All fired bullets. No standard needed.	Wrap in soft paper tissue and place in small pill box. Box should be marked with pertinent information.	Used to determine make, caliber, type of firearm from which bullet could have been discharged.
2. Bullet and cartridge case (not fired).	Use tweezers with taped ends. Avoid damage to the case or the bullet.	Mark with initials, date and numbers that correspond with chambers, if taken from a revolver, on the nose of the bullet.	All bullets. No standard needed.	Same as above.	Used for comparison purposes.
3. Cartridge case (fired)	Pick up at the open end with tweezers. Avoid scratching.	Mark on the inside of the casing, or on the outside as near the front as possible.	All cases. No standard needed.	Same as above.	Used to determine make, caliber, and type of firearm. Also for future comparisons if weapons not recovered.
4. Shot shells (fired).	Same as above.	Mark on side of brass head of shell using officer's initials. Do not scratch, nick, mar, or multilate base of shell.	All shells. No standard needed.	Roll individually in paper and place in paper envelope.	Used to determine the gauge of gun, and for comparison of weapon marks.
5. Shot pellets	Use tweezers with taped ends. Avoid damage to rifling marks on the circumference.	Place pellets in small pill box, seal box and mark properly.	All pellets. No standard needed.	Same as Method of Marking.	The size of the shot may be consistent with other ammunition found on suspect.
6. Wadding	Use tweezers, avoid any damage to the wadding.	Mark with ink by inscribing initials of recovering officer.	All wadding. No standard needed.	Place in paper envelope.	Size of shot, and gauge designation of arm firing wads.

APPENDIX A (Continued)

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Glass 1. Fragments	Use fingers on the edge of the larger pieces. Do not touch flat surfaces. Do not grasp over obvious smudges. Process for latent prints where indicated.	Mark container with name of submitting officer, and other pertinent data. Separate questioned and known pieces.	All fragments. No standard needed.	Wrap each piece in cotton or soft paper. Pack to prevent shifting and further breakage.	Used to identify fragments taken from scene of crime. Used to determine direction of break force.
2. Particles	Use tweezers for pieces too small for fingers.	Same as above.	All particles. Three inch piece of broken item as standard.	Place in pill box, seal, and protect from further breakage.	Same as above.
Hair	Carefully remove hairs from crime scene with a pair of tweezers.	Same as above.	All portions of hair found at scene. Twenty or more full length hairs from body and head, when possible.	Fold clean sheet of paper, place hair in fold, and place in envelope.	Used to determine color, structure, etc.
Impressions 1. Footprints 2. Tireprints 3. Small impressions	For a summary of the technique for handling impressions, see Chapter XIII.	Photograph the impression and include a ruler in the picture to keep in proper perspective. Label back of picture with pertinent data.	Enough photographs to show full impression from all angles.	Place in property envelope and seal.	Used for comparison purposes.
Liquid Poison, acid and others.	Leave in original container. Examine container for latent prints.	On outside of container, place a label with pertinent information.	All of specimen if in adequate container, otherwise up to 4 ounces.	If in glass container pack absorbent material around it and place in strong box.	Used to determine the actual content of the fluid.
Liquor	Same as above.	Inscribe identifying mark on metal can or label with pen.	All of specimen. No standard needed.	Place in paper evidence bag and label appropriately.	Used to determine alcoholic content.

APPENDIX A (Continued)

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Suspected Narcotics and Dangerous Drugs 1. Liquids	Leave in original container. Examine container for latent prints.	Place label with perteinent data on outside of container.	All of specimen. No standard needed.	Pack absorbent material around all glass to prevent breakage, label "Fragile."	May show the substance is not narcotic or dangerous or will identify the drug recovered.
2. Tablets, powder, and solids	Use tweezers or small brush to transfer any particles to the proper container.	Same as above.	All of specimen. No standard needed.	Place in properly sealed pill box or other container adequate to prevent loss.	Same as above.
Paint 1. Liquid	Leave sample in original container, if possible. If transfer is necessary, pour cautiously being careful not to spill any of the sample.	Place label with all pertinent data on the container.	All if in good container otherwide up to 4-ounces. An original unopened container up to 1 gallon for standard.	Pack to prevent undue breakage or spillage.	Used to determine texture and content for comparison purposes.
2. Chips	Handle with tweezers or scoop chips with a piece of paper. Chips should be collected so as to keep them intact.	Mark the sealed container with pertinent data.	All of specimen. When possible, an adequate amount of material from suspected object to be used as standard.	Place in pill box or other rigid container.	Chips found at scene may be traced to suspect and used for comparison.
Rope, twine, or cordage	Handle small pieces with tweezers. Avoid damage to large pieces by transferring carefully to the proper container.	Mark on tag or container all pertinent data.	All of specimen. One foot of original.	Place in evelope or evidence bag if small enough, if not wrap securely.	Used to compare with rope, twine, or cordage used in commission of crime.
Tools	Handle by side of tool after tool has been examined for latent prints.	Mark on side of tools. Do not mark on face of tool. Use string tag with all pertinent data.	All tools. No standard needed.	Place in evidence bag. Prevent damage of the tools.	Used to compare with tool marks.
Tool marks	Cover tool mark with soft paper to avoid damage to the mark.	When tool marks can be transferred to Laboratory Unit, inscribe name and date on object containing tool marks. Do not mark on tool mark.	Complete tool marks. Suspected tool, when available.	Keep from contaminating the mark.	Used for comparison purposes.

Specimen	Technique for Handling	Method of Marking	Quantity of Specimen and Standard Needed	Preservation and Packing	Investigative Value
Safe insulation and soil samples	For a summary on handling safe insulation and soil samples, see Chapter VIII.	Label outside of container with pertinent data.	All of questioned specimen. Up to 4-ounces for standard.	Pack in sealed container large enough to accommodate volume.	Used for comparison purposes.

This chart is not intended to be all inclusive. If evidence is not found herein, consult the specimen list for an item most similar in nature and submit accordingly or contact the Regional Criminalistics Laboratory for advice.

APPENDIX B

NATIONAL DIRECTORY OF CRIMINALISTICS LABORATORIES

(This listing was compiled by Joseph Peterson, Ph.D., for the National Institute of Law Enforcement and Criminal Justice)

ALABAMA

Director
Alabama State Department
of Toxicology and Criminal
Investigation
P.O. Box 231
Auburn, Alabama 36830

Director
Alabama Toxicology Department
P.O. Box 2591
Birmingham, Alabama 35233

Director
Alabama Toxicology Department
P.O. Box 580
Huntsville, Alabama 35804

Director
Department of Toxicology and
Criminal Investigation
Court House
Church and Royal Streets
Mobile, Alabama 36602

Director
State Health Department
Montgomery, Alabama 36104

ALASKA

Director
General Laboratory Studies
Toxicology and Drug Analysis
Alaska Medical Laboratories
P.O. Box 4-1539
Anchorage, Alaska 99503

ARIZONA

Director
Criminalistics Laboratory
Phoenix Police Department
17 South 2nd Avenue
Phoenix, Arizona 85003

Director
Criminalistics Laboratory
Department of Public Safety
2016 W. Encanto Boulevard
Phoenix, Arizona 85005

Director
City-County Criminalistics Laboratory
P.O. Box 1071
Tuscon, Arizona 85716

UNIVERSITY PROGRAM

Chairman
Department of Police Science Administration
Northern Arizona University
P.O. Box 6014
Flagstaff, Arizona 86001

ARKANSAS

Director
Criminalistics Laboratory
Arkansas State Police
Little Rock, Arkansas 72201

CALIFORNIA

Director
Criminalistics Laboratory
Kern County Sheriff's Office
P.O. Box 2208
Bakersfield, California 93303

Director
Criminalistics Laboratory El Cajon Police Department
100 Fletcher Parkway
El Cajon, California 92020

Director
Criminalistics Laboratory
Huntington Beach Police Department
P.O. Box 70
Huntington Beach, California 92648

Director
Criminalistics Laboratory
Long Beach Police Department
400 West Broadway
Long Beach, California 90802

Director
Criminalistics Laboratory
Los Angeles Police Department
150 North Los Angeles Street
Los Angeles, California 90012

Director
Criminalistics Laboratory
Los Angeles County Sheriff's Office
501 N. Main Street
Los Angeles, California 90012

Director
Criminalistics Laboratory
Contra Costa County Sheriff's Office
P.O. Box 391
Martinez, California 94553

Note: The laboratories and facilities listed here do not necessarily represent all criminalistics capability in the respective states. Hospitals, medical examiners and coroner's offices, and some other laboratories may offer additional support to law enforcement agencies.

CALIFORNIA (Concluded)

Director
Criminalistics Section
Oakland Police Department
455 7th Street
Oakland, California 94607

Director
Criminalistics Laboratory
Alameda County Sheriff's Office
P.O. Box 787
Pleasanton, California 94566

Director
Criminalistics Laboratory
San Mateo County Sheriff's Office
Hall of Justice
Redwood City, California 94063

Director
Criminalistics Laboratory
Riverside County Sheriff's Department
P.O. Box 512
Riverside, California 92502

Director
Sacramento County Crime Laboratory
Office of the District Attorney
4400 "V" Street
Sacramento, California 95817

State of California
Bureau of Criminal Identification
and Investigation
Criminalistics Laboratory
P.O. Box 1859
Sacramento, California 95809

Director
San Bernardino County Sheriff's Department
P.O. Box 569
San Bernardino, California 92403

Crime Laboratory
San Diego Police Department
801 West Market Street
San Diego, California 92101

Director
Criminalistics Laboratory
San Diego County Sheriff's Office
222 W. "C" Street
San Diego, California 92101

Director
Criminalistics Laboratory
San Francisco Police Department
850 Bryant Street
Room 435
San Francisco, California 94103

Director
United States Army Crime Laboratory
515th Military Police Detachment
APO San Francisco, California 96343

Director
Criminalistics Laboratory
Department of District Attorney
Santa Clara County
875 San Pedro Street
San Jose, California 95110

Director
Criminalistics Laboratory
Santa Ana Police Department
Santa Ana, California 92702

Director
Criminalistics Laboratory
Orange County Sheriff's Office
P.O. Box 449
Santa Ana, California 92702

Director
Criminalistics Laboratory
Ventura County Sheriff's Office
501 POLI Street
Ventura, California 93001

UNIVERSITY PROGRAMS

Director
Forensic Science Program
School of Criminology
University of California
Berkeley, California 94720

Director
Department of Police Science and Administration
California State College at Los Angeles
5151 State College Drive
Los Angeles, California 90032

Director
Department of Police Science and Administration
Sacramento State College
6000 Jay Street
Sacramento, California 95819

COLORADO

Director
Criminalistics Laboratory
Colorado Bureau of Investigation
1550 Lincoln Street
Denver, Colorado 80204

Director
Criminal Investigation and Forensic Sciences
Laboratory
West 6th Avenue and Cherokee
Denver, Colorado 80204

COLORADO (Concluded)

Director
Criminalistics Laboratory
Denver Police Department
13th and Champa Street
Denver, Colorado 80204

CONNECTICUT

Director
Criminalistics Laboratory
Hartford Police Department
155 Morgan Street
Hartford, Connecticut 06103

Director
State Bureau of Identification
Connecticut State Police
100 Washington Street
Hartford, Connecticut 06106

UNIVERSITY PROGRAM

Director
Forensic Science Program
Division of Criminal Justice
University of New Haven
West Haven, Connecticut 06516

DELAWARE

Director
Criminalistics Laboratory
Delaware State Police
Box 430
Dover, Delaware 10101

DISTRICT OF COLUMBIA

Director
Police Laboratory
Metropolitan Police Department
300 Indiana Avenue, N.W.
Washington, D.C. 20001

Director
Criminalistics Laboratory
Federal Bureau of Investigation
Ninth and Pennsylvania Avenue, N.W.
Washington, D.C. 20535

Director
Alcohol, Tobacco and Firearms Laboratory
Internal Revenue Service
Washington, D.C. 20224

Director
Secret Service Laboratory
1800 G Street, N.W.
Washington, D.C. 20226

Director
U.S. Postal Service Crime Laboratory
1100 L Street, N.W.
Washington, D.C. 20260

Director
Forensic Sciences Division
Armed Forces Institute of Pathology
Washington, D.C. 20012

Director
Regional Criminalistics Advisor
AID - OPS/LA
Department of State
Crime Laboratory
Washington, D.C. 20523

Director
Questioned Document Laboratory
Department of Army
Washington, D.C.

UNIVERSITY PROGRAMS

Director
Forensic Science Center
Reiss Science Building
Georgetown University
Washington, D.C. 20007

Director
Department of Forensic Science
The George Washington University
Washington, D.C. 20006

FLORIDA

Director
Criminalistics Laboratory
City Police Department
Jacksonville, Florida 32201

Director
Dade County Crime Laboratory
1320 N.W. 14th Street
Miami, Florida 33125

Director
Criminalistics Laboratory
Florida Department of Law Enforcement
P.O. Box 654
Tallahassee, Florida 32302

Director
Crime Laboratory, P.B.I.A.
P.O. Box 670
West Palm Beach, Florida 33402

Director
Criminalistics Laboratory
Region IV
P.O. Box 1737
Sanford, Florida

FLORIDA (Concluded)

PROPOSED UNIVERSITY PROGRAM

Director
Criminalistics Project
Chemistry Department
Florida Technological University
Box 25000
Orlando, Florida 32816

GEORGIA

Director
Georgia State Crime Laboratory
Department of Public Safety
P.O. Box 1456
Atlanta, Georgia 30301

Director
Laboratory Branch ATF
Federal Office Building
P.O. Box 926
Atlanta, Georgia 30301

Director
U.S. Army Criminal Investigation
Laboratory
Fort Gordon, Georgia 30905

Director
Georgia State Crime Laboratory
Chatham County Branch
Box 523
Savannah, Georgia 31402

HAWAII

Director
Crime Laboratory
Honolulu Police Department
1455 S. Beretania Street
Honolulu, Hawaii 96814

IDAHO

Director
Idaho Department of Health
Laboratories Division
2120 Warm Springs Avenue
Boise, Idaho 83702

ILLINOIS

Director
Criminalistics Division
Chicago Police Department
1121 South State Street
Chicago, Illinois 60605

Director
Illinois Bureau of Identification
Highway 51
DeSoto, Illinois 62924

Director
Northern Illinois Police Laboratory
1677 Old Deerfield Road
Highland Park, Illinois 60035

Director
Criminalistics Laboratory
Illinois Bureau of Identification
515 East Woodruff Road
Joliet, Illinois 60035

Director
Illinois Bureau of Identification
299-1/2 Court Street
Pekin, Illinois 61554

Director
Illinois Bureau of Identification
c/o Pump Handle Inn
2620 11th Street
Rockford, Illinois 61101

Director
Illinois Bureau of Identification
333 15th Street
Rock Island, Illinois 61201

Director
Criminalistics Laboratory
Illinois Bureau of Identification
415 Iles Park Place
Springfield, Illinois 62703

Director
Du Page County Crime Laboratory
Du Page County Sheriff's Office
P.O. Box 300, 205 Reber Street
Wheaton, Illinois 60187

UNIVERSITY PROGRAM

Director
University of Illinois
Administration of Criminal Justice
Box 4348
Chicago, Illinois 60680

INDIANA

Director
Criminalistics Laboratory
City Police Department
Bloomington, Indiana

Director
Criminalistics Laboratory
Fort Wayne Police Department
Fort Wayne, Indiana 46802

INDIANA (Concluded)

Director
Forensic Sciences Division
Indiana State Police Department
100 N. Senate Avenue
Indianapolis, Indiana 46204

Director
Criminalistics Laboratory
Indianapolis Police Department
Indianapolis, Indiana 46201

UNIVERSITY PROGRAM

Director
Department of Police Administration
Indiana University
Room 120, Sycamore
Bloomington, Indiana 47401

IOWA

Director
Iowa Crime Laboratory
E. 7th and Court Streets
Des Moines, Iowa 50319

KANSAS

Director
Criminalistics Laboratory
Bureau of Investigation
State of Kansas
Topeka, Kansas 66612

Director
Forensic Laboratory
Wichita Police Department
115 East William
Wichita, Kansas 67202

PROPOSED UNIVERSITY PROGRAM

Director
Administration of Justice
Wichita State University
1845 Fairmont
Wichita, Kansas

KENTUCKY

Director
Criminalistics Laboratory
State Police Division
1250 Louisville Road
Frankfort, Kentucky 40601

LOUISIANA

Director
Criminalistics Laboratory
Department of Public Safety
Louisiana State Police
P.O. Box 1791
Baton Rouge, Louisiana 70806

Director
Criminalistics Laboratory
Calcasiu Sheriff's Laboratory
Lake Charles, Louisiana 70823

Director
Criminalistics Laboratory
Police Department
Box 51480
New Orleans, Louisiana 70150

Director
Acadiana Criminalistics Laboratory
P.O. Box 643
New Iberia, Louisiana 70560

Director
Northwestern Regional
Criminalistics Laboratory
Box 4
Shreveport, Louisiana 71102

MAINE

Director
State Police Crime Laboratory
36 Hospital Street
Augusta, Maine

Director
Maine Department of Health and Welfa
State House
Augusta, Maine

UNIVERSITY PROGRAMS

Director
Criminal Justice Program
University of Maine
Augusta, Maine

Director
Criminal Justice Program
University of Maine
Bangor, Maine

MARYLAND

Director
Criminalistics Laboratory
Baltimore Police Department
601 E. Fayette Street
Baltimore, Maryland 21202

Director
Criminalistics Laboratory
Hagerstown Jr. College
Hagerstown, Maryland 21740

Director
Criminalistics Laboratory
Maryland State Police
Pikesville, Maryland 21205

MARYLAND (Concluded)

Director
Criminalistics Laboratory
Montgomery County Police Department
108 S. Perry Street
Rockville, Maryland

Director
Criminalistics Laboratory
Prince George's County Police Department
410 Addison Road
Seat Pleasant, Maryland 20027

Director
Criminalistics Laboratory
Ocean City Police Department
Snow Hill, Maryland 21863

Director
Criminalistics Laboratory (Baltimore County P.D.)
Bosley Avenue and Kenilworth Drive
Towson, Maryland 21204

MASSACHUSETTS

Director
Criminalistics Laboratory
Boston Police Department
154 Berkeley Street
Boston, Massachusetts 02116

Director
Criminalistics Laboratory
Department of Public Safety
1010 Commonwealth Avenue
Boston, Massachusetts 02215

UNIVERSITY PROGRAM

Director
Chemistry Department
Boston State College
625 Huntington Avenue
Boston, Massachusetts 02120

MICHIGAN

Director
Criminalistics Laboratory
City Police Department
Records and Identification Bureau
Dearborn, Michigan 48125

Director
Scientific Bureau
Detroit Police Department
1300 Beubien Street
Detroit, Michigan 48226

Director
Michigan State Police
Scientific Laboratory
714 South Harrison Road
East Lansing, Michigan 48828

Director
Chemist-Crime Laboratory
Prosecuting Attorney's Office
105 Courthouse
Flint, Michigan 48208

Director Criminalistics Laboratory
Police Headquarters
333 Monroe Avenue, N.W.
Grand Rapids, Michigan 49502

Director
Criminalistics Laboratory
Police Department
Identification Bureau
Highland Park, Michigan

Director
Michigan State Police
Crime Laboratory
304 Garden Street
P.O. Box 1115C
Holland, Michigan 49423

Director
Division of Crime Detection
Bureau of Laboratories
Lansing Police Department
Lansing, Michigan 48933

Director
Michigan Department of Health
3500 N. Logan Street
Lansing, Michigan 48914

Director
Criminalistics Laboratory
Michigan State Police
186 S. Main Street
Plymouth, Michigan 48170

Director
Crime Laboratory
Oakland County Sheriff's Department
Pontiac, Michigan

Director
Michigan State Police
Crime Laboratory
30950 Van Dyke
Warren, Michigan 48089

UNIVERSITY PROGRAM

Director
School of Police Administration and Public Safety
Forensic Sciences Program
Michigan State University
East Lansing, Michigan 16802

MINNESOTA

Director
Criminalistics Laboratory
Bureau of Criminal Apprehension
Minnesota Department of Public Safety
1246 University Avenue
St. Paul, Minnesota 55104

Director
Criminalistics Laboratory
Police Department
101 East 10th Street
St. Paul, Minnesota 55101

MISSISSIPPI

Director
Criminalistics Laboratory
Jackson Police Department
P.O. Box 17
Jackson, Mississippi 39205

Director
Criminalistics Laboratory
Department of Public Safety
P.O. Box 6097
Jackson, Mississippi 39208

MISSOURI

Director
LEAC Crime Laboratory
Southeast Missouri State College
Cape Girardeau, Missouri 63701

Director
St. Louis County Crime Laboratory
226 S. Central
Clayton, Missouri 63105

Director
Northwest Missouri Regional
Criminalistics Laboratory
2100 North Noland Road
Independence, Missouri 64051

Director
Criminalistics Division
Missouri State Highway Patrol
1710 East Elm Street
Jefferson City, Missouri 65101

Director
Region 9 Crime Laboratory
Missouri Western College
Newman Road
Joplin, Missouri 64802

Director
Region 2 Crime Laboratory and
Identification Center
321 East Chestnut Expressway
Springfield, Missouri 65802

Director
Criminalistics Laboratory
St. Louis Police Department
1200 Clark Street
St. Louis, Missouri 63103

NEBRASKA

Director
Criminalistics Laboratory
Law Enforcement and Safety Bureau
of Criminal Investigation and Identification
14th and Burnham
Lincoln, Nebraska 68509

Director
Criminalistics Laboratory
Omaha Police Department
Omaha, Nebraska

NEVADA

Director
Criminalistics Laboratory
Clark County Sheriff's Office
200 East Carson Street
Las Vegas, Nevada 89101

Director
State Criminalistics Laboratory
790 Sutro Street
Reno, Nevada 89507

Director
Criminalistics Laboratory
Washoe County Sheriff's Office
Box 2915
Reno, Nevada 89505

UNIVERSITY PROGRAM

Director
University Criminalistics Laboratory
University of Nevada
Department of Law Enforcement
Reno, Nevada 89507

NEW HAMPSHIRE

Director
Criminalistics Laboratory
Department of Public Safety
John O. Morton Building
Concord, New Hampshire 03301

NEW JERSEY

Director
Chemist-Newark Police Laboratory
Police Academy
10008 - 18th Avenue
Newark, New Jersey 07106

NEW JERSEY (Concluded)

Director
Criminalistics Laboratory
New Jersey State Police
P.O. Box 68
West Trenton, New Jersey 08625

NEW MEXICO

Director
Criminalistics Laboratory
Department of Pathology
University of New Mexico
School of Medicine
Albuquerque, New Mexico 87109

Director
New Mexico State Police
State Crime Laboratory
P.O. Box 1628
Santa Fe, New Mexico 87501

NEW YORK

Director
Criminalistics Laboratory
New York State Police
Building No. 22
State Campus
Albany, New York 12226

Director
Buffalo Police Crime Laboratory
74 Franklin Avenue
Buffalo, New York 14202

Herbert L. MacDonnell
Consulting Criminalist
P.O. Box 1111
Corning, New York 14830

Director
Criminalistics Laboratory
Suffolk County Police Department
Veterans Memorial Highway
Hauppauge, New York 117787

Director
Nassau County Police Department
Scientific Investigation Bureau
1490 Franklin Avenue
Mineola, New York 11501

Director
Criminalistics Laboratory
New York City Police Department
235 E. 20th Street
New York, New York 10003

Director
Criminalistics Laboratory
Department of Public Safety
Police Division
209 Niagara Street
Niagara Falls, New York

Director
Public Safety Laboratory
Monroe County
150 Plymouth Avenue South
Rochester, New York 14614

Director
Syracuse Police Laboratory
Public Safety Building
511 South State Street
Syracuse, New York 13202

Director
Criminalistics Laboratory
Westchester County
Grasslands Reservation
Valhalla, New York 10595

Director
Laboratory for Forensic Sciences
87 Nepperha Avenue
Yonkers, New York 10701

Director
New York Regional Laboratory
Bureau of Narcotics and Dangerous Drugs
90 Church Street
New York, New York 10007

UNIVERSITY PROGRAM

Director
Forensic Science Program
John Jay College of Criminal Justice
315 Park Avenue South
New York, New York 10010

* (NORTH CAROLINA)

OHIO

Director
Criminalistics Laboratory
Hamilton County
3223 Eden Avenue
Cincinnati, Ohio 45219

Director
Criminalistics Laboratory
Cleveland Police Department
2001 Payne Avenue - Room 301
Cleveland, Ohio 44114

* See page 185 for North Carolina listings.

OHIO (Concluded)

Director
Criminalistics Laboratory
Cuyhoga County Coroner's Office
1212 Adelbert Road
Cleveland, Ohio 44106

Director
Criminalistics Laboratory
Columbus Police Department
Columbus, Ohio 43215

Director
Ohio State Highway Patrol
Investigation and Laboratory Section
Columbus, Ohio 43224

Director
Criminalistics Laboratory
Dayton Police Department
335 West 3rd Street
Dayton, Ohio 45401

Director
N.W. Ohio BCI&I Laboratory
405 Pine Street
Fremont, Ohio

Criminal Identification and
Investigation Bureau
Northeast Ohio Regional Crime Laboratory
Kent State University
Kent, Ohio 44240

Director
Criminalistics Laboratory
Ohio Bureau of C.I.I.
P.O. Box 365
London, Ohio 43140

Director
BCI Regional Laboratory
Administration Building
30335 Oregon Road
Perrysburg, Ohio 43601

Director
Criminalistics Laboratory
Toledo Police Department
525 Erie Street
Toledo, Ohio 43601

Director
Worthington Police Department
789 High Street
Worthington, Ohio 43085

Director
Crime Laboratory and Records
Police Department
Youngstown, Ohio 44501

OKLAHOMA

Director
Oklahoma State Bureau of Investigation
Laboratory Division
4363 N.W. 10th Street
Box 7-F, Farley Station
Oklahoma City, Oklahoma 73107

Director
Criminalistics Laboratory
Oklahoma City Police Department
Oklahoma City, Oklahoma

OREGON

Director
Crime Laboratory
Eugene Police Department
777 Pearl Street
Eugene, Oregon 97401

Director
Oregon State Police Crime
Detection Laboratory
364-1/2 West 7th
Eugene, Oregon 97401

Director
Oregon State Police Crime Detection
Laboratory
P.O. Box 1648
Medford, Oregon 97501

Director
Oregon State Police Crime Detection
Laboratories
Blue Mountain Community College
P.O. Box 1519
Pendleton, Oregon 9701

Director
Crime Detection Laboratory
Oregon State Police
University of Oregon Medical School
3181 S.W. Sam Jackson Park Road
Portland, Oregon 97201

Director
Criminalistics Laboratory
Portland Police Department
222 S.W. Pine Street
Portland, Oregon 97204

PENNSYLVANIA

Director
Bethlehem Criminalistics Laboratory
Pennsylvania State Police
2930 Allentown-Schoenersville Road
P.O. Box 2005
Bethlehem, Pennsylvania 19001

PENNSYLVANIA (Concluded)

Director
Regional Criminalistics Laboratory
Pennsylvania State Police, Troop "A"
P.O. Box 38
Greensburg, Pennsylvania 15601

Director
Criminalistics Laboratory
Pennsylvania State Police
21st and Herr Street
Harrisburg, Pennsylvania 17013

Director
Buck's County Criminalistics Laboratory
2659 Trenton Road
Levittown, Pennsylvania 10056

Director
Forensic Chemist
Office of the District Attorney
Delaware County
Media, Pennsylvania 19063

Director
Police Chemical Laboratory
Room 305
Police Headquarters
Franklin Square
Philadelphia, Pennsylvania 19106

Director
Pittsburgh-Allegheny County
Crime Laboratory
401 Courthouse
Pittsburgh, Pennsylvania 15219

Director
Criminalistics Laboratory
Pennsylvania State Police
475 Wyoming Avenue
Wyoming, Pennsylvania 18644

UNIVERSITY PROGRAMS

Director
Division of Police and Public Administration
Harrisburg Area Community College
3300 Cameron Street Road
Harrisburg, Pennsylvania 17110

Director
Forensic Chemistry Program
Department of Chemistry
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

Director
212 Whitmore Laboratory
Pennsylvania State University
University Park, Pennsylvania 16802

SOUTH CAROLINA

Director
Criminalistics Laboratory
South Carolina Law Enforcement Division
P.O. Box 1166
Columbia, South Carolina 29202

Director
Pathology and Chemistry Department
Medical University of South Carolina
Charleston, South Carolina 29401

PUERTO RICO

Director
Criminal Laboratory
Puerto Rico Police
G.P.O. Box 938
Hato Rey, Puerto Rico 00919

Director
U.S. Customs Laboratory
P.O. Box 2112
Old San Juan Station
San Juan, Puerto Rico 00903

RHODE ISLAND

Director
Laboratories for Scientific Criminal Investigation
University of Rhode Island
Kingston, Rhode Island

Director
Rhode Island State Police Mobile Crime Lab
Rhode Island State Police Headquarters
P.O. Box 185
North Scituate, Rhode Island

Director
Rhode Island Division of Criminal Identification
Providence Courthouse
250 Benefit Street
Providence, Rhode Island 02903

SOUTH CAROLINA

Director
Criminalistics Laboratory
South Carolina Law Enforcement Division
P.O. Box 1166
Columbia, South Carolina 29202

Director
Pathology and Chemistry Department
Medical University of South Carolina
Charleston, South Carolina 29401

SOUTH DAKOTA

Director
Crime Laboratory
Division of Criminal Investigation
State Capitol Building
Pierre, South Dakota

TEXAS

Manager
Crime Laboratories Bureau
Texas Department of Public Safety
Box 4143
Austin, Texas 78765
Headquarters Laboratory - Austin
Field Laboratories* - Dallas
- Tyler
- Houston
- Corpus Christi
- Midland
- El Paso
- Lubbock
- Waco

*Operational May 1, 1972

Director
Dallas County Criminal Investigation Laboratory
Southwestern Institute of Forensic Sciences
5230 Medical Center Drive
Box 35728
Dallas, Texas 75235

Director
Criminalistics Laboratory
Fort Worth Police Department
1000 Throckmorton Street
Fort Worth, Texas 76102

Director
Police Laboratory
Houston Police Department
61-Riesner Street
Houston, Texas 77002

Director
Criminalistics Laboratory
San Antonio Police Department
Box 9346
San Antonio, Texas 78204

UTAH

Director
Crime Laboratory
Davis County Sheriff's Office
Davis County Corthouse
Farmington, Utah 84025

Director
Crime Laboratory
Cache County Sheriff's Office
Logan, Utah 84321

Director
Crime Laboratory
Ogden Police Department
Ogden, Utah 84401

Director
Crime Laboratory
Weber County Sheriff's Office
Ogden, Utah 84401

Director
Division of Health
44 Medical Drive
Salt Lake City, Utah 84113

UNIVERSITY PROGRAM

Director
Police Science Department
Weber State College
Ogden, Utah 84401

VERMONT

Director
Vermont State Police Laboratory
Redstone
Montpelier, Vermont 05602

VIRGINIA

Director
Northern Virginia Police Laboratory*
4250 North Fairfax Drive
Arlington, Virginia 22203

Director
Tidewater Regional Crime Laboratory*
711 Crawford Street
Portsmouth, Virginia 23704

Director
Division of Consolidated Laboratory Services
Bureau of Forensic Science
404 N. 12th Street
Richmond, Virginia 23219
Parent Laboratory - Richmond
Regional Laboratories - Norfolk
Roanoke
Fairfax

* To become integral parts of State Bureau of Forensic Science

WASHINGTON

Director
Crime Laboratory
Bellevue Police Department
111-116 S.E.
Bellevue, Washington 98004

Director
Crime Laboratory
Seattle Police Department
Room 219
Public Safety Building
Seattle, Washington 98104

WASHINGTON (Concluded)

Director
King County Crime Laboratory
King County Courthouse
516 3rd Avenue
Seattle, Washington 98104

Director
Drug Control Assistance Unit
Spokane Regional Laboratory
Room 1120 Public Safety Building
Spokane, Washington 99201

Director
Crime Laboratory
Tacoma Police Department
County-City Building
Tacoma, Washington 98402

UNIVERSITY PROGRAMS

Director
Police Science Department
106 Van Doren
Washington State University
Pullman, Washington 99163

Director
Department of Law Enforcement Studies
Spokane Community College
Mission Avenue Campus
Spokane, Washington

WEST VIRGINIA

Director
Criminalistics Laboratory
West Virginia State Police
725 Jefferson Road
South Charleston, West Virginia 25303

WISCONSIN

Director
Glendale Crime Laboratory
5909 N. Milwaukee Parkway
Glendale, Wisconsin 53209

Director
Crime Laboratory
Sheriff's Department
Kenosha, Wisconsin 53141

Director
Wisconsin State Crime Laboratory
4706 University Avenue
Madison, Wisconsin 53705

Director
Bureau of Laboratories
Health Department
Municipal Building
841 North Broadway
Milwaukee, Wisconsin 53203

WYOMING

Director
Criminalistics Laboratory
P.O. Box 3228
Laramie, Wyoming 82970

NORTH CAROLINA

Director
Charlotte Crime Laboratory
Law Enforcement Center
825 East 4th Street
Charlotte, North Carolina 28202

Director Crime Laboratory
State Bureau of Investigation
421 North Blount
Raleigh, North Carolina 27601

Based upon previously discussed criteria, the following states have no active criminalistics laboratories:

MONTANA
NORTH DAKOTA
TENNESSEE

Many names of laboratories included in this directory were taken from existing lists in the forensic science literature. A master list was compiled and submitted to LEAA's system of State Planning Agencies which in turn consulted with criminalists in the respective states in making necessary additions and deletions. Criteria used in determining if a facility would be labeled a criminalistics laboratory were the following:

1. A criminalistics laboratory should, at the minimum, have capabilities in the area of wet-chemical analysis, microscopy, and photography.
2. The laboratory must employ on a permanent basis at least one scientist with training in the physical sciences.
3. The laboratory should have responsibility for the collection and analysis of physical evidence in its jurisdiction, and have staff who deliver expert testimony in court.
4. In this particular listing, identification bureaus, coroner's and medical examiner's offices, and laboratories dedicated to the analysis of narcotics and dangerous drugs were not included.

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